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# School foodservice administrators' perceptions of required and/or desired inputs to implement a HACCP-based food safety plan: A national study

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# School foodservice administrators' perceptions of required and/or desired inputs to implement a HACCP-based food safety plan: A national study

by

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Five years ago, I literally stumbled upon the Child Nutrition Leadership Academy; a program that was tailor-made for me to fulfill my life-long dream of obtaining my doctoral degree. At the time, perceived challenges and rewards were completely surmountable in my mind. Thank goodness I persevered and have now experienced some of the most demanding and gratifying years of my life.

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## ABSTRACT

The Child Nutrition and WIC Reauthorization Act of 2004 required school food authorities to implement a food safety program based on HACCP principles at each preparation and service facility within the district participating in the National School Lunch or School Breakfast Program. The purpose of this study was to identify public school foodservice administrators' perceptions of required and/or desired inputs by their districts to comply with the new HACCP-based food safety program mandate.

An electronic survey, developed with input from a national panel of experts, was sent to a stratified, random national sample of public school foodservice administrators ($N$ = 1,850). Respondents ($n$ = 567) provided information regarding large and small equipment purchases, staffing, program development time, training, and assessed attitudes about HACCP/food safety training, HACCP benefits, and challenges. Further, four site observations of elementary and secondary school kitchens were conducted, including district- and site-level management interviews to provide support for national survey findings.

Study results indicated most districts ($n$ = 501–557) did not purchase large equipment items (range of 55% to 90%) because of insufficient funds ($n$ = 87, 72.5%). However, if cost were no object, approximately 60% of respondents would buy blast chillers and warming units ($n$ = 261, $n$ = 267, respectively) and 70% ($n$ = 317) would purchase freezer/cooler alarm systems. These findings indicate there may be the perception that blast chillers, warming units, and freezer/cooler alarm systems are required for a HACCP-based food safety plan, however there is limited research concluding these components are necessary. Large districts purchased more large equipment per site than did small- and medium-sized districts. The majority of school districts (88.2%, $n$ = 468) had purchased thermometers

either prior to (70.9%) or after (17.3%) the 2004 mandate, with bi-metallic stemmed thermometers being purchased in the highest quantity (*Mdn* = 12 per district). Shallow pans (2" deep) were identified by almost 60% (*n* = 129) of respondents as the item purchased in the greatest quantity on a list of other small equipment, with a median of 21 pans per district. Large districts purchased more small equipment per site than did small districts.

Most respondents (95.4%; *n* = 392) indicated district foodservices had not hired more staff as a result of the new mandate. There was an increase in food safety training reported for both site-level managers and food assistants. The most frequent provider of the food safety/HACCP training was the district's foodservice staff. The district foodservice director was primarily responsible for writing the original standard operating procedures, using a median of 40 hours for development.

Most respondents (81.4%; *n* = 413) replied there had not been any additional costs associated with obtaining the required number of annual health inspections. The Western USDA region was found to pay significantly higher fees for health inspections. The reason(s) for this finding are unknown. Using the Kruskal-Wallis test, differences in estimated cost based on year of Coordinated Review Effort (CRE), USDA region, educational level, size of school district, and years of school foodservice experience were investigated. No significant differences were found based on year of CRE. Respondents from the Southeast region purchased significantly more small equipment than did those in the Midwest and Western regions and reported significantly more food safety training hours than did respondents from the Midwest region or from the Mountain Plains region. Respondents with a graduate degree purchased significantly more large and small equipment for their districts than did those with a bachelor's degree. Large school districts reported significantly more food safety training

hours for site-level managers than did small districts. Finally, respondents with 26 plus years of school foodservice experience purchased significantly more small equipment items than did respondents with 0–5 years of school foodservice experience.

This study also identified overall challenges to HACCP implementation as perceived by school foodservice administrators. Respondents ($n$ = 292) indicated time ($n$ = 85), paperwork ($n$ = 47), training ($n$ = 38), and money ($n$ = 37) as barriers to HACCP. Although barriers existed, 90% ($n$ = 205) of respondents agreed the food safety federal mandate has resulted in safer food served to children participating in the National School Lunch and School Breakfast Programs. Finally, study findings have several implications for practitioners. Those in charge of school meal programs should be sure that there is training on proper use of bi-metallic stemmed thermometers, and need for proper calibration of this widely used food temperature measuring device; maintaining food and equipment temperature monitoring equipment; and work simplification techniques to reduce time associated with monitoring and documenting the plan.

# CHAPTER 1. INTRODUCTION

## *Background*

Children are considered at high risk for contracting foodborne illness due to their immature immune systems (McCabe-Sellers & Beattie, 2004; School Food Safety Program, 2008). More than 28 million children are served each day through the federal school meal programs at an average cost of $8 billion per year (Ralston, Newman, Clauson, Guthrie, & Buzby, 2008). In 2003, the U.S. Government Accounting Office ([GAO], 2003a) released a 10-year report that concluded school meal programs in the U.S. had a low incidence of foodborne illness outbreaks. Approximately 3% ($n$ = 195) of the total number of outbreaks ($N$ = 7,390) during the past 10-year period occurred in school meal programs. However, this statistic would be meaningless to parents or guardians of children sickened from eating food served in the National School Lunch Program (NSLP), or the National School Breakfast Program (NSBP). It was stated in the GAO (2003a) report that foodborne illness outbreaks in school meal programs have been shown to infect larger numbers of people than other retail outlets. Approximately 5,500 individuals out of 33 million served from 1990 through 1999 were sickened by food served in the NSLP (GAO, 2003a).

In 1998, 11 children were infected by *Escherichia coli* (*E. coli*) 0157:H7 in school lunch taco meat in Finley, Washington. Three children developed hemolytic uremic syndrome, an acute, potentially fatal disease in which the kidneys stop functioning. Litigation followed this tragic incident and the school district was found at fault. The jury awarded $4.6 million to the plaintiffs (GAO, 2003a). The GAO (2003a) report concluded with a recommendation that options to help minimize occurrences of foodborne outbreaks in schools be identified and, further, that the costs associated with implementing any additional

measures be carefully considered, as previous reports had shown school districts in selected states experienced year-end revenue shortfalls.

On May 1, 2004, MSNBC (Microsoft Network National Broadcasting Company) *Dateline* television news correspondents released the results of a 5-month food safety investigation of 10 of the nation's largest school districts (MSNBC, 2004). The headline read, "How safe are your kids' school lunches?" Investigators reviewed health inspections and conducted site visits to school districts' food production and service areas with health inspectors. Findings included the following: rodent infestation, mold, and numerous cases of unsafe food holding temperatures. Senator Richard Durbin, of Illinois, was shown a videotape of the kitchens and was reported as saying, "It's disgusting, someone has to blow the whistle" (MSNBC).

On June 30, 2004, the 108th Congress signed Public Law 108-265, also known as the Child Nutrition and WIC Reauthorization Act of 2004, amending the Richard B. Russell National School Lunch Act and the Child Nutrition Act of 1966. A new requirement designed for improving school nutrition programs included developing, implementing, and sustaining a district-wide food safety program based on hazard analysis and critical control point (HACCP) principles. School food authorities were required to implement a school food safety program for each meal preparation and service site in their respective districts that complied with guidelines established by the Secretary (Child Nutrition and WIC Reauthorization Act, 2004). No additional federal funding was appropriated to compensate districts for costs associated with the new mandate.

School food authorities were required to comply with Section 111 of the Child Nutrition and WIC Reauthorization Act of 2004 (Public Law 108-265) no later than July

2006 (U.S. Department of Agriculture, Food and Nutrition Service [USDA/FNS], 2005b). The majority of school districts prior to 2004 did not have food safety plans in place (Giampaoli, Sneed, Cluskey, & Koenig, 2002; Henroid & Sneed, 2004; Hwang, Almanza, & Nelson, 2001). Thus, many school districts have had to devote time and other resources to develop and implement plans to comply with the federal regulation. In June 2005, USDA/ FNS (2005b) released *Guidance for School Food Authorities: Developing a School Food Safety Program Based on the Process Approach to HACCP Principles*. This guidance identified the minimum elements that must be included in a food safety plan based on HACCP principles. The mandate did not include the requirement that specific equipment be purchased to comply with the law. However, to determine if critical limits are met, temperature measuring devices must be utilized. There has been no research related to the inputs (time, equipment purchases, staffing, etc.) required to implement food safety programs in schools and little research related to inputs of HACCP implementation in other sectors of the retail foodservice industry.

### *Purposes of the Study*

The purpose of this study was to identify public school foodservice administrators' perceptions of required and/or desired inputs by their districts to comply with the HACCP-based food safety program mandated by Public Law 108-265, section 111 for Child Nutrition Programs (CNPs) in the U.S. Further, HACCP-based program requirements that are desired, yet not implemented were identified. The study also sought to determine if public school foodservice administrators perceived the HACCP-based food safety program as beneficial. An electronic survey was used to collect data.

*Research Questions*

1. What were estimated inputs (equipment purchases, labor, and training) incurred by public school districts to meet requirements of their districts' food safety plan?
2. Was there an increase in food safety/HACCP training as a result of the new requirement to implement a food safety plan based on HACCP principles?
3. What organizations provided the food safety and/or HACCP training?
4. What were estimated costs associated with developing and implementing districts' original food safety standard operating procedures?
5. What costs were associated with meeting the requirement for two food safety inspections from an approved entity?
6. Was there a difference in estimated costs to implement a HACCP-based food safety plan based on year of Coordinated Review Effort, USDA region, educational level, years of experience, and size of school district?
7. What were the overall challenges perceived by public school foodservice administrators with implementation of the district's HACCP-based food safety plan?

*Significance of the Study*

CNPs are the first retail segment of the foodservice industry mandated by the federal government to implement a food safety program based on HACCP principles. Costs and inputs associated with this process have not been identified; therefore, findings from this study will be of great interest to district administrators, school food authorities, state departments of education, federal agencies, and private companies. Currently, this requirement is an unfunded mandate, and compliance may be difficult for school foodservice programs that already operate in the red. In addition, many school foodservice directors do

not know how to develop and implement a cost-effective HACCP program. Research findings may help generate cost-effective solutions and determine if there is a need to appropriate additional funding to support food safety efforts at the school and district levels.

### *Limitations of the Study*

Although this study sought to identify inputs associated with implementing a federally mandated program, it may be challenging to separate costs of doing business (i.e., what should have been done prior to the mandate) from costs of the HACCP-based requirements. The federal deadline to implement a HACCP-based food safety plan was July 2006. It is possible that school districts did not implement the plan or incur food safety related costs until after this date. This research sought to capture input and cost-related data from school year 2004 until July 2006; therefore inputs and costs after this date will not be included. For example, costs related to food safety training after school year 2005–2006 were not captured, but may have been incurred by school districts. Further, present day equipment pricing will be used to determine an estimated, average cost of large and small equipment identified by respondents as purchased from before and after the 2004 mandate. Finally, obtaining detailed information, such as cost and time, may seem tedious or information unknown to the respondents

### *Definitions of Terms*

The following terms represent definitions specific to food safety and/or this research:

**A la carte or competitive food:** Purchases of individual food items not taken as part of a reimbursable meal (Ralston et al., 2008).

**Complex food item:** Food that travels through the temperature danger zone more than once in a retail operation. For example, foods prepared in advance for service another day (USDA/FNS, 2005b).

**Coordinated Review Effort (CRE):** A review of school foodservice programs conducted once every 5 years by state agencies to ensure reimbursable meals meet all standards set forth by USDA and to assure local districts receive the technical assistance and resources needed to meet these standards (USDA, 2005).

**Critical control point (CCP):** Point or procedure in a specific food system where loss of control may result in an unacceptable health risk (USDA/FNS, 2005b).

**Critical limit:** Time and temperature ranges for food preparation and service that keep food safe. May be one or more prescribed parameters that must be met to ensure a CCP effectively controls the hazard (USDA/FNS, 2005b).

**District size classification:** In this study, a small school district was defined as student enrollment up to 2,499, medium districts were defined as enrollment of 2,500 to 9,999 students, and large districts were defined as more than 10,000 students. The definition of school size was established by Iowa State Child Nutrition Program students (Hanna, 2008; Thornton, 2007).

**Foodborne illness:** Diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food (USDA/FNS, 2005b).

**Foodborne illness outbreak:** Foodborne illness that affects at least two or more people (USDA/FNS, 2005b).

**Food safety plan:** A written document based on the principles of HACCP that delineates procedures that must be followed to improve food safety (USDA/FNS, 2005b).

**HACCP:** Hazard Analysis Critical Control Point is a preventative system to reduce the risk of foodborne illness through appropriate food handling, monitoring, and record keeping (USDA/FNS, 2005b).

**No cook:** Food that does not travel completely through the temperature danger zone in the retail operation. Examples include deli meats, salads, and yogurt (USDA/FNS, 2005b).

**Prerequisite programs:** A strong foundation of procedures that address the basic operational and sanitation conditions within an operation, i.e. good manufacturing practices (GMPs), vendor certification programs, first-in-first-out (FIFO) inventory rotation procedures, and recipe/process instructions (Goodrich, Schneider, & Schmidt, 2005).

**Process approach:** A method of conducting a hazard analysis by using food preparation processes common to a specific operation. More specifically, individual food flows are categorized into similar groups, hazards are analyzed, and critical limits are set (USDA/FNS, 2005b).

**Same day service:** Food that travels through the temperature danger zone one time in the retail operation, for example, chicken nuggets and pizza (USDA/FNS, 2005b).

**School food authority (SFA):** The governing body that is responsible for one or more schools; and has the legal authority to operate child nutrition programs therein or otherwise approved by USDA to operate the program as defined under 7 CFR Part 210.2 for the national school lunch program, 7 CFR Part 220.2 for the school breakfast program, and 7 CFR Part 225.2 for the summer food service program (USDA/FNS, 1995).

**School foodservice administrator:** The person most responsible for oversight of the school foodservice programs in each school in the district (Thornton, 2007).

**Site-level foodservice assistant:** Hourly employees performing day-to-day activities such as preparing and serving meals to children within an educational setting following USDA National School Lunch and Breakfast guidelines (Wilson, 2007).

**Site-level foodservice manager:** Considered person-in-charge of site-level foodservice assistants; typically salaried personnel responsible for overall site operation (Hanna, 2008).

**Standard operating procedure (SOP):** A written method of controlling a practice in accordance with predetermined specifications to obtain a desired outcome (USDA/FNS, 2005b).

**Temperature danger zone (TDZ):** Temperatures that allow pathogenic microorganism growth or toxin formation. The 2005 *Food Code* defines the TDZ as 41°F–135°F (U.S. Department of Health and Human Services, Public Health Service, U.S. Food and Drug Administration [FDA], 2005b).

# CHAPTER 2. LITERATURE REVIEW

## *Introduction*

CNP costs and inputs associated with implementing and sustaining a school food safety program based on HACCP principles, as required by Public Law 108-265, had not been reported on a national level until August 2008. The *School Food Safety Program Based on Hazard Analysis and Critical Control Point Principles* (2008) proposed rules stated the Regulatory Impact Analysis estimates the total cost associated with implementing a HACCP-based food safety program in schools was $42.5 million in 2005. Five-year estimates total $99.3 million and are expected to be on the decline due to one-time program development costs incurred in 2005 (School Food Safety Program, 2008). In 2000, the U.S. Department of Agriculture (USDA) Economic Research Service (ERS) estimated medical costs, productivity losses, and costs of premature deaths from five major foodborne pathogens at $6.9 billion. The Web-based ERS Foodborne Illness Cost Calculator was developed to explore cost estimates from outbreaks of *Salmonella* and *E. coli* 0157:H7. In 2007, the cost estimates for *Salmonella* (all sources) and shiga toxin-producing *E. coli* O157 was $2,544,394,334 and $459,707,493, respectively (USDA/ERS, 2008). Today, cost estimates for only these two pathogens are available. In the future, ERS will add cost estimates for *Campylobacter* (foodborne sources), non-O157 shiga toxin-producing *E. coli* (non-STEC O157; all sources), and *Listeria* (all sources; USDA/ERS, 2008).

In 2003, Sneed and Henroid reported on a national study with 10 selected school foodservice directors who had successfully implemented HACCP programs in their districts. The panel was identified based on recommendations from state directors of CNPs. Although most of the directors ($n$ = 10) stated they understood the benefits of HACCP in preventing

foodborne illness in schools, half of the directors indicated the greatest obstacles to improving food safety were time and money.

The purpose of this study was to identify what a national sample of public school foodservice administrators perceived as inputs required and/or desired by their districts to comply with the new HACCP-based food safety program mandated by Public Law 108-265, section 111 for CNPs in the U.S. A review of literature included the following topics: history of HACCP, HACCP and food safety federal mandates, revenue and school meal programs costs associated with HACCP implementation, perceived barriers to HACCP, and perceived benefits of HACCP.

### *History of HACCP*

The concept of HACCP as it relates to food originated during the 1960s with the competitive race between the U.S. and Russia to land a spaceship on the moon. The National Aeronautics and Space Administration, the U.S. Army, and the Pillsbury Company worked together to ensure the safety of astronauts' food supply (World Health Organization, Mediterranean Zoonoses Control Center [WHO/MZCC], 2004). High priority was placed on conducting hazard analyses of food ingredients and respective processes used in their development (Bryan, 1999).

In 1971, the first National Conference on Food Protection (CFP) was held to evaluate current food protection activities. Outbreaks of botulism in commercially canned foods resulted in the U.S. Food and Drug Administration (FDA) mandating HACCP programs for low-acid canned food production. HACCP emerged as a better approach to food safety than end-product testing because of the large number of samples needed to provide confidence in

the final product (Bryan, 1999). The Pillsbury Company published *Food Safety Through the Hazard Analysis and Critical Control Point System* in 1973 (WHO/MZCC, 2004).

Over the next two decades, HACCP has continued to be promoted and endorsed by organizations such as the World Health Organization; International Association for Food Protection (formerly International Association of Milk, Food and Environmental Sanitarians); U.S. Department of Agriculture, Food Safety and Inspection Service (USDA/FSIS); and the FDA. Further, computer software to aid in hazard analysis is available from USDA (Bryan, 1999). This software focuses on traditional HACCP procedures as required for food processors and manufacturers.

In response to recommendations from the National Academy of Sciences, federal legislation (Departmental Regulation 1043-28) was passed in 1988 to create the National Advisory Committee on Microbiological Criteria for Foods (NACMCF). NACMCF was developed to provide impartial, scientific advice to federal food safety agencies in an effort to create integrated national food safety programs from farm to fork (USDA/FSIS, 2006). NACMCF released the first HACCP guidance in 1992. In 1997, a revision of this document was published, which is still in use (NACMCF, 1997).

NACMCF defined HACCP as a systematic approach to the identification, evaluation, and control of food safety hazards in foods based on seven principles:

1. Conduct a hazard analysis, whereby food safety hazards are identified and evaluated.
2. Identify critical control points (CCPs).
3. Establish critical limits for each critical control point.
4. Establish critical control point monitoring procedures.

5. Establish corrective actions.
6. Establish verification procedures.
7. Establish record-keeping and documentation procedures. (NACMCF, 1997)

Principles were originally designed with food processors and manufacturers in mind. These organizations were concerned about food safety of one product at a time, whereas the challenge for retail foodservice operations is to contend with multiple products and processes as they flow through a facility (U.S. Department of Health and Human Services, FDA, Center for Food Safety and Applied Nutrition [FDA/CFSAN], 2006).

Since 1997, HACCP principles have been modified slightly into a process approach for use in retail foodservice operations, including schools. The process approach categorizes many menu items in an establishment into broad categories based on activities or stages in the flow of food through an establishment, then analyzes the hazards within each group and places managerial controls on each grouping (FDA/CFSAN, 2006).

The FDA/CFSAN (2006) released guidance material for retail operators who choose to voluntarily apply HACCP principles. This guidance describes the process approach and introduces retail operators to three food preparation processes: no cook, same day service, and complex. Instead of conducting a hazard analysis for individual food items, foods are grouped into one of three food preparation processes and controls are developed for risk factors that could occur within that category. The first step is to categorize menu items, then filter out foods that require time and temperature control for safety (TCS). This guidance provides operators with detailed information on how to get started developing a food safety program (FDA/CFSAN, 2006).

In 2003, Iowa State University (ISU) developed and released Web-based information regarding HACCP in schools, including a sample plan and numerous standard operating procedures (SOPs; ISU Extension, 2008). School districts were able to download sample SOPs and make modifications to provide customized food safety information based on state and local requirements. These SOPs were updated to reflect the 2005 *FDA Food Code* (ISU, 2008)

Schools were required to develop and implement HACCP-based plans by June 30, 2006 (Child Nutrition and WIC Reauthorization Act, 2004). USDA/FNS (2005b) released guidance for CNPs to use in developing a school food safety program based on the process approach to HACCP. The guidance was released approximately one year after the federal mandate was passed. In this document, the process approach was defined with process categories of no cook, same day service, and complex food preparation recommended. Further, USDA/FNS outlined steps similar to the original FDA 1997 HACCP guidance that included monitoring, corrective action, verification, and record-keeping procedures. Sample SOPs were included for schools to use when writing their food safety plan (USDA/FNS, 2005b).

More recently, USDA in cooperation with the National Food Service Management Institute (NFSMI, 2006) released *Developing a School Food Safety Program,* aimed at providing school districts with sample SOPs and training tools. Sample SOPs were Web-based and districts were able to download and make modifications as necessary. This material referred to the process approach as a "modified process approach" and is consistent with the guidelines published by USDA/FNS (2005b). In addition, some state departments of education, for example Kansas (Kansas Department of Education, 2008) and North Carolina

(North Carolina Department of Education, 2008), developed and provided food safety program templates for its districts,.

### *HACCP and Food Safety Federal Mandates*

The first federally mandated implementation of a food safety system was enacted in 1973. With concerns over outbreaks of *Clostridium botulinum* in canned foods, the FDA published regulations to ensure low-acid, packaged foods had adequate heat treatment and were not hazardous (FDA, 2005b). The current Good Manufacturing Practice Regulations (GMPs) for low-acid canned foods (21 CFR 113) became effective in March 1973. The purpose was to protect consumers from pathogens, especially *Clostridium botulinum.* These FDA GMPs outline the equipment, controls, manufacturing, processing, and packing procedures that are required to ensure the production of a safe product (FDA/CFSAN, 1997).

In 1993, hundreds of people were sickened and four children died after eating meat contaminated with *E.coli* O157:H7 sold at units of the Jack in the Box™ restaurant chain in the northwest region of the U.S. (Golan et al., 2004). This major outbreak led to the 1996 federal legislation, *Final Rule on Pathogen Reduction and Hazard Analysis Critical Control Point (PR/HACCP) Systems,* published by USDA/FSIS. This legislation required all federally inspected meat and poultry processing plants to adopt HACCP systems to ensure science-based process controls were in place to prevent and reduce food safety hazards that may occur in their particular processes and products. The required implementation date was based on size of operation; larger facilities were allotted up to 18 months, whereas smaller processing plants were allowed up to 42 months (USDA/FSIS, 1996). By 1999, HACCP systems were included in the federal food code as guidance for operators and food safety (health) inspectors.

Fish and fishery products are also known causes of foodborne illness (FDA/CFSAN, 2001). In 1996, HHS/FDA mandated processors of all fish and fishery products, including imported seafood, to develop and implement HACCP systems (FDA/CFSAN, 2001). HHS/FDA in 2001 mandated HACCP principles be applied to fruit and vegetable juices due to several foodborne illness outbreaks associated with fresh, unpasteurized juices (Hazard Analysis and Critical Control Point, 2001).

In 1998, 11 children were infected by *E. coli* 0157:H7 from the taco meat served in a school lunch program in Finley, Washington (GAO, 2003a). A 2002 GAO report indicated that since the 1990s there had been an increase in foodborne illness outbreaks in schools. Because of media attention to the outbreaks and the results of the GAO (2002) report, Senator Richard Durbin of Illinois and other legislators passed the Child Nutrition and WIC Reauthorization Act of 2004, which required all school districts participating in the National School Lunch and Breakfast Programs to implement a food safety plan based on HACCP principles as outlined in federal legislation. With this legislation, school foodservice programs became the first retail segment required by law to implement and sustain a food safety program based on HACCP principles.

### *Revenue and School Meal Programs*

School foodservice operators are expected to run self-sufficient foodservice programs (Sackin, 2006). Those who serve as the district's representative to USDA CNPs are required to operate nonprofit programs for the benefit of enrolled children. All revenue generated should be used solely to operate or improve the CNP, with an accumulation of no more than 3 months operating expense (USDA/ERS, 2008). School food revenues may not be used to purchase land or buildings, or to construct buildings. Allowable costs include salaries,

benefits, food (except foods of minimum nutritional value), supplies, purchased service, equipment, and indirect costs. In addition, child nutrition funds may not be used to pay for any debts, fines, penalties, entertainment, and personal memberships (USDA, 2003). During school year 1992–1993, the School Lunch and Breakfast Cost Study I (SLBCS-I) was conducted in 94 school districts from around the U.S. to determine costs needed to produce reimbursable school lunches and breakfasts, including indirect and local administrative costs. The study reported that, on average, CNPs operated at a break-even level, with total revenues about equal to total reported costs. Surprisingly, this study found that school meals subsidized the cost of selling a la carte or competitive foods (Abt Associates, 1994).

In 2003, the GAO (2003a) conducted a study of how school foodservice revenues and expenses had changed since 1996. Six states (representing four of the seven USDA regions) were selected for the study. Data were collected from state-level financial reports as opposed to district-level reports in SLBCS-I. Results showed school meal program revenues were obtained from two major sources: federal reimbursement dollars and food sales, including meals and a la carte or competitive food sales, to adults and students. Major expense categories included food and labor. Overall, the GAO (2003a) found that within all six states, CNPs were experiencing an increasing revenue shortfall each year.

In 2008 the School Lunch and Breakfast Cost Study II (SLBCS-II; USDA/FNS, 2008a) final report was released. It found that school food authorities (SFAs) were operating at a break-even level for reported costs; however total revenues did not cover expenditures when unreported costs were included. Unreported costs are defined as costs attributable to foodservice operations that are not charged to the nonprofit foodservice account. Thus, the full cost to produce a reimbursable meal was defined as revenues minus reported and

unreported expenditures. Unreported expenditures were classified as labor, indirect costs, and depreciation of equipment. Examples of unreported expenditures included school district personnel support for foodservice activities and utilities. As found in SLBCS-I, SFAs continued to subsidize a la carte or competitive foods sales with production of reimbursable school meals (U.S. Government Accountability Office [GAO], 2005).

In 1995, USDA implemented the School Meals Initiative for Healthy Children (SMI). SMI nutrition standards were based on age-appropriate Recommended Dietary Allowances (RDAs) and goals from the *Dietary Guidelines for Americans* to plan and evaluate school meals (USDA/FNS, 2008b). Compliance with new nutritional regulations was expected by school year 1996–1997. March and Gould (2001) compared school meal programs' ability to comply with current federal nutrition guidelines with factors predicting financial self-sufficiency. Self-sufficiency was defined as total revenues minus total expenditures minus any general fund transfers. This study found that school districts in Kansas ($n = 58$) that met or exceeded SMI goals were financially solvent, whereas districts ($n = 14$) that did not meet SMI goals were not financially solvent. It was concluded that school meal programs could reduce food costs while maintaining nutrient quality. However, this study was conducted in one state; thus, researchers warned findings may not be generalizable (March & Gould, 2001).

As part of the 2004 Child Nutrition and WIC Reauthorization Act, school districts were required to develop and implement a wellness policy that addressed availability of foods accessible to students during the school day. Schools received a dual challenge that year: development and implementation of a wellness policy and development and implementation of a food safety plan based on HACCP principles. Neither federal mandate

appropriated additional federal or state funding for school meal programs. Research to identify the costs resulting from these federal mandates to school districts and CNPs is critical.

### *Costs Associated with HACCP Implementation*

There is a paucity of research identifying costs and inputs associated with implementing and sustaining a food safety program based on HACCP principles in the retail sector. Almanza and Ghiselli (1998) conducted a study in four grill-type restaurants to determine costs of HACCP implementation. These restaurants used meat and poultry products purchased in a precooked form whereby the product was received frozen, thawed, and served as a cold item or the product was thawed (often as part of heating process), heated, and served. These researchers set up a pilot HACCP program to determine the amount of time and labor required to implement HACCP-based duties for steps involved with purchasing, receiving, storage, preparation, and service. At the time this study was conducted, the process approach to HACCP had not been released by FDA/CFSAN (2006). An audit-type checklist based on critical control points throughout the flow of food was created. This document was called a "HACCP Checklist" by the researchers in this study. Using the HACCP checklist, managers conducted four site inspections throughout a 24 hour period (operations were open 24 hours). During the site inspection managers reviewed monitoring logs and observed employees completing food safety tasks when possible. The time it took for management to conduct the site inspections using the HACCP Checklist was recorded. Employees recorded critical control point measurements at the work station and identified compliance with food safety standards based on FDA's 1995 *Food Code* and Indiana's state and local health department requirements. Many of the procedures employees

were asked to monitor were part of their regular work duties; therefore time employees' spent completing these tasks was not recorded. Management determined these tasks should be incorporated into the employees' daily duties; thus, total actual cost related to HACCP implementation could not be determined.

Almanza and Ghiselli (1998) found that the time needed to complete the manager's HACCP Checklist (site inspection) averaged approximately 30 minutes with a range of 15 minutes to almost an hour. The researchers speculated management experience could have been one reason for the varied time requirement. If the site inspections were conducted four times during the workday, almost 2 hours of management's time would be required to complete these. Almanza and Ghiselli estimated it would cost each outlet $6,697 per year (based on current managers' average weekly salary) if managers conducted four site inspections per 24-hour period. However, at the conclusion of the study, the number of site inspections was reduced to three due to financial and time concerns. Site inspection times were based on nonbusy meal periods (10:30 a.m., 4:30 p.m., and 10:00 p.m.). The reason for so many inspections during the 24-hour period is unknown. If management required one inspection per 24 hour period, the cost could be reduced considerably. Almanza and Ghiselli concluded that, in spite of costs associated with HACCP implementation, management should not risk the safety or health of their customers and the benefits far outweigh the costs for foodservice operations that implement HACCP. Just one severely injured victim involved in the 1993 Jack-in-the-Box™ outbreak was awarded $15.6 million after recovering from kidney failure and a 42-day coma. In the end, the retail outlet Jack-in-the-Box™ paid over $50 million in over 100 settlements (Marler, 2008).

A number of studies have been conducted in meat and seafood processing sectors on costs and benefits associated with HACCP implementation. Prior to the Pathogen Reduction HACCP ruling in 1996, USDA/FSIS estimated key costs of HACCP implementation for meat and poultry processing plants to range from $1.1 to $1.3 billion over the next 20 years (Crutchfield, Buzby, Roberts, Ollinger, & Jordan Lin, 1997). In a 1996 report, Roberts, Buzby and Ollinger concluded that HACCP implementation resulted in an expense of approximately 20¢ per pound for large meat and poultry processing plants. In 1997, ERS released *An Economic Assessment of Food Safety Regulations: The New Approach to Meat and Poultry Inspection* report (Crutchfield et al.). Average Pathogen Reduction HACCP ruling costs per pound (beef, poultry, and pork) were estimated at 0.0005¢ for small operations (those with 10–500 employees). Antle (2000) developed a theoretical economic cost benefit model for small meat processing plants (those processing less than 100 million lbs./year). He concluded small processors cost increases would be 0.009¢ per pound. Boland, Hoffman, and Fox (2001) conducted a post-implementation HACCP cost study in small meat slaughter and processing plants in North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Oklahoma. As in the ERS research, this study defined small meat processing plants as having 10 to 500 employees. Eighteen plants agreed to participate in the survey. Data collection occurred from June to December 1999. Costs associated with HACCP implementation (design costs, internal employee training, new employee training, equipment costs, monitoring, recordkeeping, and periodic review costs) were tracked. This study found that small meat processors in the Great Plains region averaged 0.007¢ per pound in order to comply with the 1996 Pathogen Reduction HACCP ruling.

A costs and benefits study was conducted in the United Kingdom (UK) dairy processing sector (Henson, Holt, & Northen, 1999). Participants were selected from the UK Yellow Pages directory; a questionnaire was mailed to companies listed under dairy or ice cream processing ($N$ = 1196). Respondents ($n$ = 192) were given a list of costs associated with HACCP implementation identified in previous studies. They were asked to rank these costs according to importance within their processing plants. Costs were ranked in two categories: cost of implementing HACCP and cost of operating HACCP. If a cost had not been incurred, respondents were to write "0" on the importance ranking. Staff time in documenting HACCP system was ranked as the highest cost by respondents ($n$ = 87) for implementing HACCP, and recordkeeping was ranked as the highest cost by respondents ($n$ = 79) for operating HACCP. Similarly, benefits of HACCP based on previous studies were listed and respondents were asked to rank these. Increased ability to retain existing customers was ranked as the greatest benefit to HACCP by about a third of the respondents ($n$ = 65) (Henson et al.).

ERS has released a number of reports since 2000 identifying costs and benefits of implementing HACCP food safety plans in nonretail, food manufacturing operations (Golan et al., 2004; Golan, Vogel, Frenzen, & Ralston, 2000; Ollinger & Mueller, 2003). In 2004, Ollinger, Moore, and Chandran released findings from the first national survey regarding the types and amounts of food safety investments made by cattle, hog, and poultry slaughter and processing plants since PR/HACCP. Implementation of PR/HACCP began in 1997 for larger processing plants, with the mandate fully implemented in all size plants by January 2000. The sample was selected from a USDA/FSIS database of businesses inspected by USDA/FSIS, including cattle, hog, and poultry slaughter operations and beef, hog, and

poultry processing plants. Processed product examples included hotdogs, cooked roast beef, and ham. Respondents ($N$ = 996) represented the following types of operations: cattle and hog slaughter facilities ($n$ = 252), poultry slaughter plants ($n$ = 122), and processing only operations ($n$ = 622). Processors were divided into two categories—raw meat and cooked meat products—based on products. Average cost to implement HACCP was estimated at an additional 1.5¢ to 2.5¢ per pound for cattle and hog slaughter operations. Poultry slaughter operations averaged expenses of less than 1¢ per pound, cooked meat (no slaughter) averaged costs of 1.5 to 3.5¢ per pound, and raw meat (no slaughter) averaged additional costs of 1.5¢ per pound to implement HACCP requirements. Further, the Ollinger et al. study asked respondents to identify the most costly and the most beneficial practices for pathogen control. *E. coli* testing and the zero fecal matter standard were identified as the most costly by 60% of plant managers of cattle slaughter facilities ($n$ = 90), whereas only 30% of these respondents believed these practices to be the most beneficial (Ollinger et al.).

The Department of Health and Human Services (HHS) Centers for Disease Control and Prevention (CDC) *Morbidity and Mortality Weekly Report* (MMWR) is a publication that compares current, annual cases of foodborne illness in the U.S. to the number of cases identified from the baseline period of 1996–1998. Though wholesale and retail foodservice operations have incurred costs related to food safety, the 2004 and 2005 MMWR annual report showed incidences of *E. coli* O157:H7 and other shiga toxin-producing *E. coli* had declined, as had the number of cases of *Campylobacter, Listeria, Salmonella, Shigella*, and *Yersinia* (CDC, 2006).

### *Perceived Barriers to HACCP in Schools*

Barriers to HACCP implementation in schools have been identified through various studies. Hwang et al. (2001) identified labor cost as well as funding for training as a potential barrier. In a 2003 study, a focus group of 10 school foodservice directors from around the U.S. were asked, "What challenges did you face in developing and implementing your HACCP program?" (Sneed & Henroid, 2003). In that study directors identified the following challenges: inconsistencies in the understanding and application of HACCP by state and local health departments; employee attitudes; costs, including cost of equipment; and keeping processes current. In a survey of 461 school foodservice directors from around the U.S., over 50% stated time and money as the greatest obstacle to improving food safety (Giampaoli, Sneed, Cluskey, & Keonig, 2002). Further, employee attitudes, nervousness about taking food safety certification examinations, and not feeling comfortable with change were noted as challenges to implementing a food safety plan (Giampaoli, Sneed, et al.). Youn and Sneed (2002) conducted a national survey of school foodservice directors ($n$ = 414) on perceived barriers to HACCP. Employee training was rated as the greatest barrier with 65% strongly agreeing (22%) or agreeing (43%) that employees needed more training to improve food safety practices. In addition, time and money were also perceived as barriers to HACCP implementation.

In 2005, NSFMI (2005) conducted a study to determine the extent of HACCP implementation in schools. Of the 2,200 school foodservice managers surveyed, 396 responded, for a response rate of 18%. Lack of resources (time and personnel) and the burden of required HACCP documentation were the most reported barriers.

### *Perceived Benefits of HACCP in Schools*

Although federally mandated, meat and poultry processing plants have concluded that the benefits to HACCP far outweigh the costs associated with implementing and sustaining a HACCP-based food safety program (Ollinger & Ballenger, 2003). In the Sneed and Henroid focus group study in 2001, directors were also asked what advantages there were to having a HACCP program. The 10 school foodservice directors were very positive about HACCP. These directors reported money and time savings through decreased food waste and improved food quality as benefits to HACCP implementation (Sneed & Henroid, 2003). HACCP requires a thorough review of food, from procurement to production and service, as well as the facility (Almanza & Sneed, 2003). This process helps school foodservice operations identify areas of improvement; thus, HACCP benefits the overall operation and acts as an insurance policy (Almanza & Sneed, 2003).

The NSFMI 2005 study reported 55% ($n$ = 217) of responding managers stated that the benefits of HACCP included employees were practicing good hygiene and almost 50% ($n$ = 198) stated HACCP implementation promoted a routine cleaning and sanitation program. Cleaning and sanitizing is considered a pre-requisite program to HACCP. One fourth ($n$ = 99) of these respondents reported HACCP is beneficial in reducing liability. Overall, the advantage to HACCP is that the seven principles can be applied to almost all types of foodservice operations; thus, consumers benefit by having safer food (NSFMI, 2005).

### *Summary*

Implementing a school food safety program based on HACCP principles is required by federal law (Child Nutrition and WIC Reauthorization Act, 2004). Research has been conducted to identify extent of HACCP implementation, barriers or challenges to HACCP

implementation, and benefits of a HACCP-based food safety program in schools (NFSMI, 2005, Giampaoli, Sneed, et al., 2002; Sneed & Henroid, 2003). However, there is no research identifying the costs of implementing and sustaining a food safety plan based on HACCP principles.

School food operations are required to be nonprofit and accumulate no more than 3 months operating expense (USDA/FNS, 2008b). Since 1994, budgets have tightened and school foodservice programs may not operate in ways seen in previous years (Ralston et al., 2008b). Most programs in the early 1990s operated at break-even levels, however with rising indirect costs and unfunded federal mandates the financial status of school foodservice operations may be in jeopardy (Abt Associates, 1994; Ralston et al.).

# CHAPTER 3. METHODOLOGY

The purpose of this study was to identify public school foodservice administrators' perceptions of required and/or desired inputs by their districts to comply with the federal HACCP-based food safety program mandate required as of July 1, 2006. Further, HACCP-based program requirements that are desired, yet not implemented, were identified by administrators. The study also sought to determine if public school foodservice administrators perceived the HACCP-based food safety program as beneficial. This chapter will describe research design, subjects, instruments, and procedures.

## *Research Design*

The research process consisted of three phases using a variety of methods to address the research questions. In Phase 1, a panel of public school foodservice directors provided expert opinions regarding HACCP inputs and costs. In Phase 2, a national survey was developed from results provided by the expert panel and sent to a national sample of public school foodservice administrators. The national survey asked administrators to identify what they perceived as inputs necessary to meet federally mandated food safety program requirements and to provide estimates of these costs. In addition, administrators were asked if they believed required implementation of a HACCP-based food safety plan had been beneficial in safeguarding children participating in the school meals program. In Phase 3, the researcher conducted four site observations and interviewed site-level managers to determine the amount of time during the workday foodservice staff spent completing duties related to the food safety program and conducted interviews with school foodservice administrators to identify food safety related costs and perceptions of support by these districts' superintendents and Boards of Education (BOE).

Researchers involved with this study completed human subjects training provided by ISU. Research protocol and all survey instruments were submitted to the ISU Institutional Review Board with approval obtained prior to data collection. Copy of the approval is included in Appendix A.

## *Phase 1—Expert Panel*

### *Study Sample*

A convenience sample of 12 current public school foodservice directors from various locations around the U.S. were selected to participate on or as members of the expert panel. The panelists were asked to identify requirements and costs associated with the federally unfunded food safety program mandate. Directors were selected based on recommendations from food safety industry specialists and state directors from Georgia, Florida, and Alabama. Participants were selected from each of the seven USDA regions and contacted in advance to determine their willingness to participate in the panel.

### *Survey Instrument*

The questionnaire (Appendix B) included open-ended questions so that foodservice directors could identify HACCP implementation inputs, i.e., time, training, large and small equipment, health inspections, consultants, or additional staffing inputs. These categories were predetermined based on HACCP requirements outlined in the federal guidance as well as a review of literature. In addition, participants were encouraged to identify other inputs that were associated with implementing their HACCP-based food safety plan.

### *Data Collection*

A cover letter (Appendix C) and questionnaire (Appendix B) were e-mailed to each participant in June 2007. Twelve responses were received from the seven USDA regions:

Northeast ($n$ = 2); Mid-Atlantic ($n$ = 2); Southeast ($n$ = 1); Midwest ($n$ = 2); Southwest ($n$ = 1); Mountain Plains ($n$ = 2); and Western ($n$ = 2).

*Data Analysis*

The researcher compiled responses and identified similar categories of inputs and costs, such as training, large and small equipment, and time. Inputs that the researcher was unaware of emerged, i.e., purchases of freezer and cooler alarm systems and the hiring of HACCP administrators or supervisors. Findings from the initial sample were used in the development of the national survey for Phase 2 and provided content validity for the questions included in that questionnaire.

*Phase 2—National Survey of Foodservice Administrators*

*Study Sample*

The study population consisted of public school foodservice administrators who were accessible by e-mail. A nationwide list of public school foodservice administrators' names and e-mail addresses was compiled by members of the Iowa State Child Nutrition Leadership Academy from 2006 through 2007. Sources of e-mail addresses included school foodservice administrators, state agencies, state USDA commodity directors, industry partners, school district Web sites, and state School Nutrition Association executive directors. In states where none of these organizations maintained a list, an Internet search for individual school foodservice director e-mail addresses was conducted for districts listed by the U.S. Department of Education, National Center for Educational Statistics (2000). Every effort was made to capture the population of public school district foodservice administrators in the country with e-mail addresses. All lists were edited to remove any names that were not from

public school districts. The total population of school foodservice administrators with an e-mail address identified was 13,026 (Rice, 2007).

A stratified, random sample of public school foodservice administrators by USDA region was selected for this study. The recommended number of completed surveys for a population between 10,000 and 20,000 at a 95% confidence level and a ±5% sampling error is 370 (Dillman, 2007). Recent graduates of the Iowa State Child Nutrition Leadership Academy have averaged a 25% response rate from electronic surveys (Rice, 2007; Schweitzer, 2007; Thornton, 2007). Based on Dillman's recommendations and a conservative estimated response rate of 20%, a sample size of 1,850 was determined. In an effort to get equitable representation from each of USDA's seven regions, the 20% response rate was calculated for each region, as shown in Table 1. The population was sorted by USDA region and an appropriate number of participants were selected from each region using random number assignment in Microsoft Excel™.

Table 1. *Sampling Frame of Public School Districts by USDA Region*

| USDA region | Number of school foodservice administrators | % of administrators per region | Sample size |
|---|---|---|---|
| Northeast | 1,731 | 13.29 | 246 |
| Mid-Atlantic | 1,335 | 10.25 | 190 |
| Southeast | 1,045 | 8.02 | 148 |
| Midwest | 3,065 | 23.53 | 435 |
| Southwest | 1,979 | 15.19 | 281 |
| Mountain Plains | 2,257 | 17.33 | 321 |
| Western | 1,614 | 12.39 | 229 |
| TOTAL | 13,026 | 100.00 | 1,850 |

*Survey Instrument*

From feedback provided by the expert panel in Phase 1 of this study, an electronic written questionnaire was developed. Two food safety experts reviewed the questionnaire for content validity. The questionnaire consisted of two parts. Part I sought to determine inputs related to developing and implementing a food safety plan based on HACCP principles. Demographic questions were presented in Part II.

Part I questions were presented in the following categories: equipment purchases by district; facility renovations and upgrades; organizational inputs such as training, writing SOPs, and obtaining the required number of health inspections; and perceptions of respondents about HACCP implementation and effectiveness. In some cases, questions included whether equipment items had been purchased before or after the 2004 federal mandate in an effort to identify whether items had been purchased to comply with the new requirement. The electronic survey consisted of 56 multiple choice, 18 yes/no, two rating questions, and four open-ended response opportunities.

Expert panelists had identified commonly purchased large equipment items (greater than $500 expenditure), including blast chillers, warmers, and freezer/cooler alarm systems. The electronic survey asked participants to identify if these items, as well as other large equipment items typically needed to implement a food safety plan, had been purchased and included blank spaces for respondents to identify other, non-listed items. The top three small equipment items purchased by the expert panelists were thermometers, chill sticks, and color-coded cutting boards. These options were included in the electronic survey in addition to space for respondents to list other small equipment items that had been purchased by their districts. Prior research has identified that training and funding for training are barriers to

implementing HACCP plans in school foodservice (Hwang et al., 2001; Youn & Sneed, 2002). Survey questions about food safety training included: number of training hours for assistants and managers; hourly wages for employees; and if manager-level food safety certification was required, and if so, by whom. Participants were asked to identify HACCP team members and to estimate the number of hours required to develop the district's SOPs. Finally, Part I asked participants several open-ended questions regarding their perceptions of HACCP and the effectiveness of the HACCP requirement on safeguarding school meals.

Part II of the survey included questions about characteristics of the school district and respondent. Items regarding the school district included student enrollment, number of sites that prepare or prepare and serve food, USDA region, date of upcoming Coordinated Review Effort (CRE), and type of foodservice management currently in place (self-operated or managed services). Questions related to the survey responder included title, food safety certification, education level and background, professional credential(s), gender, and years of work experience in school foodservice. The survey instrument was pilot tested with 15 public school foodservice directors selected from a convenience sample that represented all USDA regions. Modifications were made as necessary, such as adding more detail to large and small equipment descriptions. For example, blast chillers were originally identified by physical size. The chilling capacity was added to the description to help participants identify the specific type purchased. Color-coded cutting boards were sold in sets. The survey questions were edited to reflect these modifications after the pilot test. The final questionnaire was reviewed and approved by committee members and the Institutional Review Board (see Appendix D) before sending to participants.

*Data Collection*

To achieve a high response rate, a four-step process was initiated based on recommendations by Dillman (2007) for electronic surveys. On April 4, 2008, foodservice administrators were sent an e-mail notification asking for their participation in the study (Appendix E). A cover letter (Appendix E) and Web-based survey (Appendix D) were e-mailed to a stratified random sample of 1,850 public foodservice administrators on April 8, 2008. SurveyMonkey.com™ was utilized in the development and distribution of the national survey. A maximum of 25 e-mails were distributed at a time to prevent filtering by the school district's firewall. E-mails returned as undeliverable were collected. Bad addresses were corrected, if possible, and requests re-sent.

Approximately 1 week after respondents received the cover letter and survey, all nonrespondents were e-mailed a reminder (Appendix E). A final request was made on April 22, 2008, 3 weeks after the initial questionnaire was sent (Appendix E). In an effort to obtain a comparable response rate by USDA region, the researcher called participants in low participating regions and conducted the survey via telephone. Approximately 12 surveys were completed via telephone from the Mid-Atlantic and Southwestern regions. Telephone surveys were conducted the first week of May 2008.

*Data Analysis*

SPSS-X (version 15) was used to analyze the survey data. Normality of each variable was assessed by computing values of skewness and kurtosis. A normal distribution has skewness and kurtosis values near zero (+/-1). The further the values of skewness and kurtosis are from zero, the more likely the variables are not normally distributed (Tabachnick & Fidell, 2007). Most of the variables in this study had values greater than +/-1 and were not

normally distributed. Visual inspections of the histograms of each variable also showed most were not normally distributed. Therefore, the median, minimum, and maximum values are reported for most variables. If a variable was normally distributed, the mean and standard deviation were reported.

Because the data were not normally distributed, the Kruskal-Wallis test was used to compare groups of respondents on the dependent variables. The Kruskal-Wallis test is the equivalent of analysis of variance (ANOVA) but used when data are nonparametric. For the Kruskal-Wallis test, scores were ordered from lowest to highest, ignoring the group to which the score belonged. Then the lowest score was assigned a rank of 1, the next highest score a rank of 2, and so on. The ranked scores were then placed back into their respective groups and the ranks for each group were summed. The test statistic, *H*, was computed and the chi-square distribution was used to test for significant differences among groups (Field, 2004).

When the Kruskal-Wallis test indicated a significant difference between groups, the Mann-Whitney test was used to conduct post hoc testing of pairs of groups for significant differences on the variables. The Mann-Whitney test is the equivalent of the independent *t* test but used when data are nonparametric (Field, 2004). Similar to the Kruskal-Wallis test, it also orders scores from lowest to highest and then ranks the scores, giving the lowest score a value of 1, the next highest score a value of 2, and so on. The ranked scores were then placed back into their respective groups, and the ranks for each group were summed. The test statistic, *U*, was computed (Field, 2004).

All post hoc comparisons conducted using ANOVA are computed simultaneously. However, post hoc comparisons with the Mann-Whitney test are done one pair at a time. Therefore, there was an increased probability of making a Type I error with each additional

comparison made. A Bonferroni correction was used to decrease the probability of making a Type I error when conducting several Mann-Whitney *U* tests for post hoc comparisons on the same data set. At $\alpha = 0.05$ for *k* tests conducted, each individual test was conducted at a Type I error rate of $\alpha/k$ (Kleinbaum, Kupper, Muller, & Nizam, 1998). Effect size for significant findings was computed using the equation:

$$r = \frac{Z}{\sqrt{N}}$$

where *Z* is the *z*-score for the Mann-Whitney *U* statistic and *N* is the number of total participants. Values below 0.30 indicate a small effect; values between 0.30 and 0.50 indicate a medium effect; and values above 0.50 indicate a large effect (Field, 2004).

## *Phase 3—Case Study*

### *Study Sample*

Two school districts in the state of Florida were contacted to participate in Phase 3 of the study. Both districts operate on-site food production facilities. Districts were identified by the Florida State Department of Education as having successfully implemented a food safety program in compliance with the federal mandate. In addition, one of the selected school district's HACCP plan was used as a template for other school meal programs in the state of Florida. In each district, two sites were selected based on recommendations by the district's foodservice director and/or HACCP administrator. Selected sites were managed by well-trained, long-term staff and had successfully implemented the district's HACCP plan according to the director and/or HACCP administrator.

*Data Collection*

School districts were contacted via telephone to participate in the study. A telephone script (Appendix H) was developed and used for the initial contact. After participation was agreed upon, dates for site visits were determined. School district representatives reviewed and signed a study consent form (Appendix I) during the site visit. A site manager interview form (Appendix F) and school foodservice HACCP administrator interview form (Appendix G), based on ones used by Almanza and Ghiselli (1998) and Giampaoli, Clusky, and Sneed (2002), were developed after a review of the literature. The site manager interview form was used to obtain information regarding the time it takes to conduct food safety self-inspections and how often food safety inspections are conducted, to determine how monitoring logs are used, and to identify HACCP-related problems. The school foodservice HACCP administrator interview form was used to identify food safety costs associated with large and small equipment; how many hours of food safety training administrators participated in prior to implementing HACCP; and questions aimed at determining how supportive school district departments, i.e., BOE, superintendent, and maintenance, have been towards implementing food safety policies and procedures. The site manager interview form and school foodservice HACCP administrator form were pilot tested by the researcher in Haywood County, North Carolina. Ease of use and comprehensiveness related to food safety activities at the site level were determined. No modifications to the forms were made upon completion of the pilot test. The site manager interview form was coded as follows: District 1, site(s) A and B; District 2, site(s) A and B. Structured interview forms were developed for use with building site foodservice manager and with the district-level HACCP administrator (Appendix F, Appendix G).

The researcher conducted one full-day site observation in each district. Both elementary and secondary level buildings were included. Managers and staff were observed, and the site manager was interviewed. Effectiveness of the HACCP-based food safety program was not determined. The building foodservice manager was asked a series of questions about equipment items purchased for this particular site. The district-level school foodservice HACCP administrator was interviewed on days of the site visits to obtain costs of food safety program implementation (equipment, planning, and development) and perceptions of support by the superintendent and BOE.

*Data Analysis*

Results from four site observations in two districts and interviews with managers at each of these sites were compiled. The average time, based on manager interviews, it takes staff to conduct food safety related tasks was computed. Responses to the structured interviews with the district-level HACCP administrators were reviewed. Perceptions of these individuals about district support for the food safety program were also assessed. Large and small equipment purchases made by these two districts were compared to findings from the national survey (Phase 2 of this study).

# CHAPTER 4. RESULTS AND DISCUSSION

## *Introduction*

This study sought to identify public school foodservice administrators' perceptions of required and/or desired inputs by their districts to comply with the HACCP-based food safety program mandated by Public Law 108-265, section 111 for Child Nutrition Programs. Findings from three phases of this study (expert panel, national survey, and case study) are presented in this chapter.

## *Expert Panel*

An expert panel of school foodservice directors served as an information resource for this study. The panelists provided information regarding HACCP implementation costs and inputs, including equipment, time, staff, and health inspections through an electronically sent, open-ended questionnaire. Information gained from the expert panel guided design of survey instruments used in the second and third phases of this study. The expert panel consisted of 12 school foodservice directors from districts located in all seven USDA regions and representing a range of student enrollments between 4,500 and 35,000. All districts were self-operated. The survey questions addressed the following: equipment purchases, organizational inputs such as training, standard operation procedure development, health inspections, and demographic questions regarding the respondent and school district. Other demographic information questions related to the number and type of foodservice operations in district and district and site-level employees CFP certifications, as shown in Table 2.

Table 2. *District Demographics of Expert Panel (*N = *12) Shown by USDA Region*

| USDA region | *n* | Average no. of on-site kitchens per district | Central kitchen (serve on-site) | District-level employees holding CFP | Site-level employees holding CFP |
|---|---|---|---|---|---|
| Northeast | 2 | 13 | 1 | 3 | 48 |
| Mid-Atlantic | 2 | 42 | 3 | 7 | 113 |
| Southeast | 1 | 20 | 0 | 5 | 23 |
| Midwest | 2 | 11 | 0 | 92[a] | 24[b] |
| Southwest | 1 | 30 | 0 | 6 | 205 |
| Mountain Plains | 2 | 24 | 3 | 9 | 208 |
| Western | 2 | 22 | 4 | 4 | 8 |

[a]One district did not separate district vs. site-level employee certification. [b]One district did not provide information.

The 12 panelists identified that the most commonly purchased large equipment items, those purchases greater than $500 expenditure were: blast chillers, warmers, and freezer/cooler alarm systems. Small equipment items purchased in the greatest number were thermometers, chill sticks, and color-coded cutting boards. Four of the responding district representatives had purchased digital thermometers. The expert panel was asked what training had they or their district-level employees participated in to comply with the new requirement to implement a food safety program. No general themes emerged related to training as the organizations providing training and number of training hours varied greatly among responding districts. Similar findings existed for site-level employee training, the training given at the building level. In eight of the twelve respondents' districts, the HACCP team consisted of the foodservice director and/or assistant foodservice director. The average number of hours indicated as needed to develop district's SOPs was 64 hours. When this

average number of hours was multiplied by the average hourly wage of $22.00, a total cost of approximately $1,400 for development of HACCP prerequisite programs was determined. One panel member (district student enrollment = 17,000) reported that his/her district had utilized a consultant in developing the school food safety program, with a total consultant's fee of $2,700. Two districts, located in the Western and Midwestern USDA region, were assessed fees for obtaining the number of health inspections now required as part of the Child Nutrition Reauthorization Act of 2004 (two per year rather than one). The average annual cost reported by these districts was $265 per building site. The total annual cost to the district located in the Western region (34 sites) was $9,000; the total annual cost to the district in Midwestern region (10 sites) was $2,650.

*National Survey*

Electronic questionnaires were sent to a random national sample of foodservice administrators ($N$ = 1,850) stratified by USDA region (Table 3). This list was compiled by members of the Iowa State University Child Nutrition Leadership Academy from 2006 through 2007. Previous studies (Hanna, 2008; Longley, 2007; Rice, 2007; Schweitzer, 2007; Thornton, 2007) have utilized this database successfully. The on-line survey was completed by 409 of the 1,850 (22%) school foodservice administrators. Additionally, the survey was partially completed by 158 of the 1,850 (8%) school foodservice administrators for a total response of 567 from the 1,850 (30%) surveys sent. Missing responses were left as missing data and not coded in any other way. For example, if a respondent did not give a value for the number of blast chillers purchased by the district, this response was coded as missing data and not assumed to be zero.

Table 3. *Return Rate of Surveys by USDA Region*

| Region | Number of surveys sent | Response rate | | | | | |
|---|---|---|---|---|---|---|---|
| | | Partially completed | | Fully completed | | Total | |
| | | *n* | % | *n* | % | *n* | % |
| Northeast | 246 | 16 | 1 | 51 | 3 | 67 | 4 |
| Mid-Atlantic | 190 | 18 | 1 | 38 | 2 | 56 | 3 |
| Southeast | 148 | 25 | 1 | 53 | 3 | 78 | 4 |
| Midwest | 435 | 34 | 2 | 88 | 5 | 122 | 6 |
| Southwest | 281 | 22 | 1 | 56 | 3 | 78 | 4 |
| Mountain Plains | 321 | 23 | 1 | 68 | 3 | 91 | 5 |
| Western | 229 | 20 | 1 | 55 | 3 | 75 | 4 |
| Total | 1,850 | 158 | 8 | 409 | 22 | 567 | 30 |

*Note.* Percent based on total sample size of 1,850.

Findings from the national electronic survey are presented in the following order: demographic characteristics, descriptive statistics regarding equipment purchases by district, facility renovations and upgrades, organizational inputs, perceptions of respondents about HACCP implementation and effectiveness, and comparisons among districts.

*Demographic Characteristics*

*Respondents.* As suggested by Dillman (2007), demographic questions were placed at the end of the electronic survey. This placement may have accounted for the lower number of responses for this section as approximately 30% of all respondents ($n$ = 158) did not provide complete information. Demographic characteristics provided by respondents are shown in Table 4.

Table 4. *Demographic Characteristics of Respondents (*N = *567)*

| Characteristics | *n* | % |
|---|---|---|
| USDA region (*n* = 409) | | |
| Midwest | 88 | 21.5 |
| Mountain Plains | 68 | 16.6 |
| Southwest | 56 | 13.7 |
| Western | 55 | 13.4 |
| Southeast | 53 | 13.0 |
| Northeast | 51 | 12.5 |
| Mid-Atlantic | 38 | 9.3 |
| Level of education (*n* = 398) | | |
| Some high school | 1 | 0.3 |
| High school | 87 | 21.9 |
| Some college | 85 | 21.4 |
| Associate degree (2-year) | 52 | 13.1 |
| Bachelor's degree (4-year) | 106 | 26.6 |
| Graduate degree | 67 | 16.8 |
| Years of Experience (*n* = 394) | | |
| 0-5 | 50 | 12.7 |
| 6-15 | 153 | 38.8 |
| 16-25 | 126 | 32.0 |
| 26 plus | 65 | 16.5 |
| Area of study[a] (*n* = 306) | | |
| Nutrition | 150 | 49.0 |
| Business | 141 | 46.1 |
| Education | 78 | 25.5 |
| Hotel & restaurant management | 78 | 25.5 |
| Culinary arts | 41 | 13.4 |
| Marketing | 31 | 10.1 |
| Other | 49 | 16.0 |
| Credentials[a] (*n* = 280) | | |
| Certified culinarian | 4 | 1.4 |
| Certified Professional Food Safety (CP-FS) | 19 | 6.8 |
| Dietary manager | 35 | 12.5 |
| Licensed dietitian | 13 | 4.6 |
| National food safety certificate | 204 | 72.9 |
| Registered dietitian | 38 | 13.6 |
| School Nutrition Specialist (SNS) | 92 | 32.9 |
| Other | 25 | 8.9 |

Table 4. (continued)

| Characteristics | *n* | % |
|---|---|---|
| Job title (*n* = 404) | | |
| District foodservice director | 278 | 68.8 |
| District foodservice manager | 54 | 13.4 |
| Business manager | 13 | 3.2 |
| Cook/supervisor | 12 | 3.0 |
| Head cook | 12 | 3.0 |
| Superintendent | 9 | 2.2 |
| Principal | 2 | 0.5 |
| Health coordinator | 1 | 0.2 |
| Curriculum coordinator | 1 | 0.2 |
| Other | 22 | 5.4 |
| Management type (*n* = 405) | | |
| Self-operated | 380 | 93.8 |
| Management company | 25 | 6.2 |
| Gender (*n* = 403) | | |
| Female | 346 | 85.9 |
| Male | 57 | 14.1 |

[a]Multiple responses given.

There were more respondents from the Midwest (*n* = 88, 21.5%) and Mountain Plains regions (*n* = 68, 16.6%) than other USDA regions. However, respondents were fairly evenly distributed (12–13.0%) from the Southwest (*n* = 56), Western (*n* = 55), Southeast (*n* = 53), and Northeast (*n* = 51) regions. The fewest number of respondents came from the Mid-Atlantic region (*n* = 38, 9.3%). This low response rate could be due to the increased numbers of school foodservice contract management companies located in the mid-Atlantic region (C. Meyer, personal communication, August 14, 2008). When compared to sample size, as identified in Chapter 3, a response rate of 20% or greater was achieved per USDA region. Almost all respondents (99.7%) had a high school education, and 13% (*n* = 52) held an

associate's degree. Almost 45% of the respondents who answered this question (*n* = 398) held a bachelor's degree (*n* = 106) or graduate degree (*n* = 67). In similar studies, a combination of bachelor's and graduate degrees held by school foodservice administrators ranged from 52% (Schweitzer, 2007) to 75% (Longley, 2007; Thornton, 2007). Respondents (*n* = 306) identified all areas of study in their formal education programs. Nutrition and business were identified by 49.0% (*n* = 150) and 46.1% (*n* = 141) of respondents, respectively. Approximately 25% of these respondents identified education (*n* = 78) or hotel and restaurant management (*n* = 78) as their primary areas of study. Almost three fourths (*n* = 280) of respondents reported having a national food safety certificate from one of three programs (ServSafe®, National Registry of Food Safety Professionals, or Prometric™) approved by the CFP. Approximately 30% of respondents who indicated certification of some type (*n* = 92) identified that they were School Nutrition Specialists; credentialed members of the School Nutrition Association (SNA).

Respondents were asked what title best described their job classification with the school district. District foodservice directors (*n* = 278) comprised 68.8%, and district foodservice managers (*n* = 54) comprised 13.4% of the 404 responding foodservice administrators. The rest of the sample identified "other": business manager (*n* = 13), cook/supervisor (*n* = 12), head cook (*n* = 12), superintendent (*n* = 9), principal (*n* = 2), health coordinator (*n* =1), and curriculum coordinator (*n* = 1). Respondents (*n* = 394) reported an average 16 years (*SD* = 8.84) of school foodservice experience. Most of the respondents who identified gender were female (85.9%, *n* = 346), and of the 405 who identified management type, most (93.8%, *n* = 380) worked in self-operated school foodservice programs.

Respondents indicated the total number of years they had worked in school foodservice. Respondents' answers to this question were grouped as follows: 0–5 years, 6–15 years, 16–25 years, and 26 plus years. These groupings are based on previous CNP research (Hanna, 2008; Thornton, 2007). Hanna found that school foodservice directors with greater than 25 years of experience reported significantly greater use of convenience foods than did directors with less than 15 years of experience. Thornton indicated further research based on years of experience should be conducted to identify if it relates to program effectiveness. Of 394 responses, 12.7% had 0–5 years experience, 38.8% had 6–15 years of experience, 32.0% had 16–25 years of experience, and 16.5% had 26 plus years of experience in school foodservice.

*School districts.* Respondents ($n$ = 399) reported the median school district enrollment, based on 2006–2007 figures, was 2,100 students, with a minimum enrollment of 55 and a maximum enrollment of 115,000 students identified. The mean was not reported because data was not normally distributed. Districts were also grouped into one of three enrollment categories: small (student enrollment up to 2,499); medium (enrollment of 2,500–9,999 students), and large districts (more than 10,000 students enrolled). Recent studies, such as Longley (2007) and Hanna (2008), used these enrollment classifications to define size of school district. This is similar to the classification used by Hwang and Sneed (2004), which defined large school districts as student enrollment greater than 10,000. Based on those respondents who supplied enrollment numbers ($n$ = 399), there were a total of 224 small districts, 113 medium districts, and 62 large districts.

Respondents ($n$ = 401) were asked to identify the number of sites in their districts that prepared or prepared and served food and, thus ,were required to have a food safety plan

based on HACCP principles. The median number of sites in districts was 4, with a minimum of 1 and a maximum of 163 reported. Respondents also were asked in what year they were scheduled to receive their CRE. Over 40% ($n$ = 170) of respondents either had had their reviews the previous year or had it planned for the upcoming school year. Surprisingly, almost 20% ($n$ = 75) did not know the year of their review. The remaining districts ($n$ = 149; 38%) were scheduled to receive their CRE between school years 2009 and 2012. In addition, respondents were asked if the district's HACCP plan had been reviewed by the state agency and whether the plan met evaluation standards. All respondents to this question ($n$ = 235) indicated the plan had been reviewed by the state agency, and 97% reported it met evaluation criteria. However, because USDA has not provided child nutrition state directors with HACCP review guidance to be utilized during CREs, the approvals are based on criteria that are not uniform among states (D. Santoro, personal communication, August 6, 2008). Lack of evaluation criteria to assess whether USDA guidance for HACCP implementation is met by school districts may lead to confusion and possible future costs. Future reviews of school districts' HACCP programs may consist of criteria not previously identified. Some state agencies have developed HACCP plan evaluation criteria for consultants or state agency representatives to use to help district personnel realize HACCP is more than maintaining temperature logs. For example, in the summer of 2008, Iowa provided HACCP plan questions for state consultants to use during CREs, such as "Is there a written plan that includes classifying TCS foods (time/temperature control for safety)?", "Are critical control points identified?", and "Is training conducted and documented?" (C. Strohbehn, personal communication, November 14, 2008). The State of Florida provided each district director a

list of criteria that would be evaluated during the CRE (D. Santoro, personal communication, September 1, 2005).

*Equipment Purchases by District*

*Large equipment purchases*. District respondents were asked whether purchases made prior to or after 2004 had been done so as a result of the federal HACCP mandate. District respondents indicated whether specific large equipment items (greater than $500 expenditure), such as blast chillers, warmers, and freezer/cooler alarm systems, had been purchased to comply with the new food safety program requirement. Findings are shown in Table 5.

Table 5. *Large Equipment Items Purchased by Districts to Comply with 2004 HACCP Requirement*

| | Purchased prior to 2004 requirement | | Purchased after 2004 requirement | | Did not purchase | |
|---|---|---|---|---|---|---|
| Item and number of total responses | *n* | % | *n* | % | *n* | % |
| Blast chillers (*N* = 557) | 21 | 3.8 | 13 | 2.3 | 523 | 94.0 |
| Freezer/cooler alarm systems (*N* = 501) | 90 | 18.0 | 21 | 4.2 | 390 | 77.8 |
| Warming units (*N* = 539) | 220 | 40.8 | 19 | 3.5 | 300 | 55.7 |

Most respondents (*n* = 523) reported blast chillers had not been purchased before or after the 2004 HACCP mandate. The Food and Drug Administration 2001 *Food Code* recommended reducing food temperature(s) from 135˚F to 70˚F in 2 hours and then from 70˚F to 41˚F in 4 hours, for a total cooling time of 6 hours. Blast chillers can meet this objective. In 2005, Olds and Sneed presented a study comparing the time and temperature differences between six cooling methods for chili using three types of cooling equipment that

might be available in foodservice operations. The objective was to determine which cooling method best met the 2001 Food and Drug Administration *Food Code* standard. Of the three types of cooling equipment tested (blast chiller, walk-in refrigerator, and chill stick), only the blast chiller met the amended FDA guidelines for cooling of this menu item. Chili was selected as the test food because it is an item that is dense and viscous and, thus, requires a longer cooling time.

Olds and Sneed (2005) stated that, although a blast chiller is a significant investment (roughly $10,000 for a small blast chiller), purchase of such an item should be considered when funds are available to upgrade equipment or when foodservice directors are remodeling or building new kitchens. Although a blast chiller has been shown to be an effective tool in meeting cooling requirements, there is limited research supporting it as a necessary component for a HACCP-based food safety plan. For the present study a quote was obtained from a commercial foodservice equipment dealer for a small unit (up to 50 lbs. chilling capacity) through Zesco Wholesale Food Service Equipment & Supplies, Indianapolis, IN. The 2008 quote for a single, small unit was approximately $13,000, supporting the 2005 statement by Olds and Sneed that this equipment item is a significant financial investment for school foodservice operations.

Almost 41% ($n$ = 220) of respondents reported purchasing warming units for implementation of the district's food safety plan prior to the HACCP requirement. Most of the respondents ($n$ = 300) had not purchased warming units specifically for implementation of the district's HACCP program, and only 19 districts (3.5% of the respondents to this question) had purchased warmers after 2004 as a result of the HACCP requirement. More than three fourths of the 501 respondents said they had not purchased freezer/cooler alarm

systems at any point in time. Almost 20% ($n$ = 90) of these respondents had purchased freezer/cooler alarm systems prior to the food safety requirement. The greatest number of respondents purchasing prior to the mandate was from the USDA Midwest region ($n$ = 19), followed by the Mid-Atlantic ($n$ = 15), and then the Southwest regions ($n$ = 14). The remaining four regions were similar in the number of respondents ($n$ = 10) purchasing freezer/cooler alarms prior to the mandate. Only 21 respondents stated freezer/cooler alarms were purchased after 2004, with the greatest number of district purchases in the USDA Southeast region ($n$ = 6). The State of Florida's *Bureau of Food Distribution Review of Individual School Form* includes an item as to whether freezer/cooler units have an alarm system (Florida Bureau of Food Distribution, 2007), which may account for these purchases in the Southeast region.

The Missouri Department of Elementary and Secondary Education released the *USDA Donated Food Distribution Program for Schools* manual in the year 2000. This guidance recommended each freezer be equipped with a temperature alarm that alerted staff when temperatures rose above 20°F with the rationale that the cost of an alarm was small compared to the cost of replacing food (Missouri Department of Elementary and Secondary Education, 2000). USDA recommended school food authorities take and record temperatures of all cooler and freezer storage units daily year-round. Although USDA does not mandate this practice, all losses due to storage unit malfunctions could be considered a result of negligence by the district, and the district would bear responsibility for replacement (Florida Bureau of Food Distribution, 2007). Thus, although state guidance could recommend the purchase of alarm systems to prevent food loss and provide safe food storage temperatures, many school districts have not yet purchased this item. The cost of freezer/cooler monitoring

systems in this study was found to be as low as $150 per unit installed. A quote for a wireless, Web-based temperature management system, obtained for the present study from Taylor Precision Products, was approximately $5,300 for a walk-in cooler and freezer. This system allows foodservice staff to view current freezer and cooler temperatures via the World Wide Web. It should be noted that this system does not alert staff when temperatures become unsafe for food storage.

Respondents were asked, "If cost were no object, how many blast chillers, warming units, and freezer/cooler alarms systems would be purchased to achieve the goals of your HACCP-based food safety plan?" Sixty percent of respondents indicated they would purchase blast chillers ($n$ = 261) and warming units ($n$ = 267). Almost 75% ($n$ = 317) of respondents indicated they would purchase freezer/cooler alarms systems. These findings indicate that school foodservice administrators may perceive that blast chillers, warming units, and freezer/cooler alarm systems are required for a HACCP-based food safety plan, however there is limited research concluding these components are necessary. Further, cost may be a significant barrier to purchasing desired equipment to meet food safety goals. The number of blast chillers, warming units, and freezer/cooler alarms purchased by each district was summed to compute the total of large equipment purchases. Of 212 respondents, the median number of large equipment purchases per district was 5, with a range of 1 to 362 items.

A list of other large equipment items was presented on the survey, and respondents were asked if any of these items had been purchased to meet their district's HACCP-based food safety plan. Almost 70% ($n$ = 317) of the respondents to this question said they had not purchased any of these items. The frequency of purchase of items by districts was 15% or

Table 6. *Additional Large Equipment Items Purchased by Districts to Meet HACCP Requirements (*N = *458)*

| Item[a] | *n* | % |
|---|---|---|
| None | 317 | 69.2 |
| Refrigerated storage | 69 | 15.0 |
| Hot holding equipment for serving | 64 | 14.0 |
| Milk cooler | 59 | 12.9 |
| Cold holding equipment for serving | 58 | 12.7 |
| Refrigerated truck | 20 | 4.4 |
| Single-tank dishmachine | 15 | 3.3 |
| Multiple-tank dishmachine | 10 | 2.2 |
| Pot & pan utensil washer | 6 | 1.3 |
| Other | 24 | 5.2 |

[a]Multiple responses given.

less, as shown in Table 6. "Other" responses included: ice machine (*n* = 3), walk-in and roll-in freezers (*n* = 3), combi oven (*n* = 2), convection oven (*n* = 1), air conditioner for dry storage (*n* = 1), HACCP monitoring temperature devices (*n* = 1), hot water booster (*n* = 1), three-compartment sink (*n* = 1), and cook and hold units (*n* = 1).

Respondents were asked if any large equipment items identified as needed in the district's food safety plan had yet to be purchased. Of the 469 respondents, 25% (*n* = 119) indicated large equipment items identified as needed in their district's HACCP-based food safety plan still had to be purchased. Almost 75% (*n* = 87) of these respondents identified the reason the purchase had not yet occurred was lack of funds in the foodservice department budget. One fourth (*n* = 29) of respondents stated lack of money (funds) in the district's

general fund as a reason why large equipment had not been purchased. These findings support the theme that cost is a barrier to HACCP. Other reasons identified by these respondents were: time to investigate options and make a purchase ($n$ = 34) and lack of funds in the district's general fund budget ($n$ = 29). These findings are shown in Table 7.

Table 7. *Reasons Why Large Equipment Items Had Not Been Purchased by Districts (*N = *120)*

| Reason[a] | *n* | % |
|---|---|---|
| Lack of funds in foodservice department budget | 87 | 72.5 |
| Time to investigate options and make a purchase | 34 | 28.3 |
| Lack of funds in the district's general fund budget | 29 | 24.2 |
| Administrative approval is needed | 22 | 18.3 |
| Lack of electricity | 16 | 13.3 |
| Administrators are not aware of need | 10 | 8.3 |
| Other | 15 | 12.5 |

[a]Multiple responses given

Over 25% ($n$ = 32) of respondents stated administrative approval was needed for purchase or that administrators were not aware of need. Thornton (2007) reported some school foodservice directors held multiple administrative titles and found this to be statistically significant in small schools in the USDA Southeast region. School foodservice administrators with multiple roles and responsibilities may not be as effective in management of various areas. In Thornton's study, the response rate for this question was too small to analyze. Approximately 15% ($n$ = 16) of respondents to this question stated lack of electricity was a reason why large equipment items had not been purchased. Respondents also identified

reasons such as the purchase was either listed in the district's 5-year plan, in process, or waiting on renovation or new construction ($n$ = 8) and space ($n$ = 4). In 1995, GAO released *School Facilities: Condition of America's Schools*. This study found that one third ($n$ = 80,000) of elementary and secondary schools in America reported at least one building in need of repair. Needed repairs most frequently listed by respondents in the study ($n$ = 7,800) were: heating and air conditioning (36%), plumbing (30%), roofs (27%), electrical power (26%), and floors/foundation (18%). In 2000, 22% ($n$ = 903) of public schools reported electric power was less than adequate (U.S. Department of Education, 2000). Although these studies may be considered out of date, electrical upgrades may still be needed in some districts. Some nonportable large equipment requires hard wiring and/or plumbing. These services may require payment from the district's general fund and, thus, is out of the school foodservice administrator's control.

*Small equipment purchases.* Respondents were asked if specific small equipment items, those less than $500 expenditure (i.e., thermometers, chill sticks, and color-coded cutting boards), had been purchased by their districts to comply with the new HACCP requirement either prior to or after the 2004 federal mandate. Many respondents ($n$ = 332; 70.9%) reported they had purchased thermometers prior to HACCP requirements, indicating an awareness of the need to check temperatures of food products. However, almost 20% of the 468 respondents indicated thermometers were purchased after the HACCP mandate. Improper cooking temperature caused the 1998 *E. coli* outbreak in a school in Finley, Washington. This outbreak could have been prevented if calibrated thermometers had been used to ensure ground meat was cooked to 155°F, as required by the Washington Department of Health (Marler, 2008).

Respondents who had purchased thermometers, before and after the 2004 food safety program based on HACCP requirement ($n$ = 379), were asked to report the number of each type of thermometer that had been purchased each year to comply with their district's food safety plan. Study findings, shown in Table 8, indicated that respondents purchased a median number of 12 (range = 1 to 300) bi-metallic stemmed thermometers per year. This was twice as many as any other type of thermometer purchase. Bi-metallic stemmed thermometers contain a coil of two different metals that contract and expand when exposed to temperatures,

Table 8. *Types of Thermometers Purchased by Districts to Meet HACCP Requirements (*N = *379)*

| | Districts that purchased | | Number purchased | | |
|---|---|---|---|---|---|
| Type of thermometers purchased | *n* | % | *Mdn* | Min | Max |
| Bi-metallic stemmed | 235 | 62 | 12 | 1 | 300 |
| Refrigerator | 322 | 85 | 7.5 | 1 | 500 |
| Freezer | 300 | 79 | 6 | 1 | 500 |
| Oven | 213 | 56 | 5 | 1 | 200 |
| Digital probe | 181 | 48 | 5 | 1 | 300 |
| Warmer/pass through | 97 | 25 | 6 | 1 | 240 |
| Sensor strips (T-stick) | 69 | 18 | 10 | 1 | 10,000 |
| Digital-dishmachine safe | 45 | 12 | 4 | 1 | 36 |
| Thermocouple | 42 | 11 | 5.5 | 1 | 36 |
| Thermocouple with infrared | 37 | 10 | 5 | 1 | 85 |
| Infrared thermometer | 40 | 11 | 3 | 1 | 60 |
| Thermocouple with HACCP logging system | 7 | 2 | 5 | 1 | 19 |

thus moving the temperature indicator. The sensing area of the thermometer is located from the tip to about two and one half inches up the stem. The resulting temperature is actually an average temperature of the food exposed to the sensing area. Therefore, these thermometers are less accurate than tip-sensitive digital and thermocouple thermometers (USDA/FSIS, 2008). Bi-metallic stemmed thermometers should be calibrated at least weekly (NFSMI, 2006).

Sixty percent of these respondents ($n$ =181) had purchased digital probe thermometers. Digital thermometers, or thermistors, measure temperature using a ceramic semiconductor bonded in the tip; therefore, they can be used to measure the temperature of thin foods. The probe is approximately one-eighth inch thick, and it takes almost 10 seconds to display a temperature (USDA/FSIS, 2008). Digital thermometers do not have to be calibrated, thus some time savings may benefit site-level staff. Further, 40 respondents had purchased infrared thermometers for their district. Infrared thermometers read the surface temperature only. This is a food temperature measuring tool that can avoid the risks of cross contamination, as there is no food contact, however the internal temperature of menu items cannot be checked.

It is recommended that verification of out-of-compliance food temperatures be done with a thermocouple (TC) thermometer (CFP, 2008). TC thermometers measure temperature at the junction of two fine wires located in the tips of the probes. An accurate, final temperature is available on a digital display within seconds of inserting the tip into the food and, thus, is highly recommended when determining doneness of thin foods (USDA/FSIS, 2008). Almost 25% of districts ($n$ = 86) had purchased some type of TC thermometer. The most recent *FDA Food Code* (FDA, 2005) requires tip-sensitive reading thermometers

(thermistor or TC thermometer) with a suitable diameter probe for accurate measurement of temperatures of thin foods, such as a hamburger patty. Although both are approved, TC thermometers provide almost an instant display of the food temperature, thus saving time. The *FDA Food Code* (FDA, 2005) rules are recommended for adoption by state agencies, therefore the food code varies by state. For example, the State of Florida Department of Health regulations are based on the 1999 *FDA Food Code* that does not require tip-sensitive reading thermometers for thin foods. Thus, thermistors and TCs would be considered best practice and may explain why bi-metallic stemmed thermometers were purchased with such high frequency.

For the present study, the following quotes were obtained from Zesco Wholesale Food Service Equipment & Supplies, Indianapolis, IN: $8.70 for a bi-metallic stemmed thermometer, $89 for a dishwasher-safe digital probe, $89 for an infrared thermometer, and $156 for a thermocouple thermometer. The total cost to a district for the purchase of 12 bi-metallic thermometers per year would be $105. The estimated cost for 12 dishwasher-safe digital thermometers would be approximately $1,000, and for 12 thermocouples, the cost would be a slightly less than $2,000. The types of thermometers identified as purchased by the majority of school districts were refrigerator thermometers ($n$ = 322) and freezer thermometers ($n$ = 300). It is possible that these were purchased more frequently as replacements because of lack of durability or because the thermometer is checked during health inspections (CFP, 2007). For the present study a quote of $6.20 for the refrigerator/ freezer thermometers was obtained from Zesco Wholesale Food Service Equipment & Supplies, Indianapolis, IN.

One respondent wrote in "cooling thermometer" as a response. In the present study cooling thermometers were identified as units similar to data loggers that take and record temperatures over time though a computerized mechanism with results displayed digitally. For the present study a quote of $52.50 for a cooling thermometer (Cool-It-Right®) was obtained from Zesco Wholesale Food Service Equipment & Supplies, Indianapolis, IN. School foodservice operations that cool foods, such as hot leftovers, at the end of the work day may benefit from cooling thermometers. Data loggers and cooling thermometers monitor the time and temperature of foods, thus notifying staff of possible time and temperature abuse, and provide documentation.

Chill sticks were purchased prior to or after the 2004 mandate by only 22.6% ($n$ = 103) of responding school districts. Olds and Sneed (2005) found that the use of a chill stick in a three-gallon stock pot of chili significantly reduced the cooling time, although it did not meet 2001 *FDA Food Code* criteria for cooling. Chill sticks are an inexpensive, easy-to-use small equipment item that can decrease cooling times for liquid products such as chili, soups, etc. Districts who purchased chill sticks to comply with the new requirement bought a median number of 10 sticks: 4 small, 4 medium, and 2 large sticks. The large chill stick, or ice paddle, holds 262 ounces (about 2 gallons) of water and could be used in a 40–60 gallon steam-jacketed kettle. When filled, this unit weighs approximately 13 pounds compared to the medium-sized chill stick (128 oz.), which weighs 9 pounds (San Jamar, personal communication, September 17, 2008). The medium-sized chill stick could be used in a 30–40 gallon steam-jacketed kettle. It is possible that the weight of the large chill stick or ice paddle is too heavy for school foodservice staff or not useful for operations of their size. For the present study a quote of $51.50 for a medium-sized (128 oz.) chill stick was obtained from

Zesco Wholesale Food Service Equipment & Supplies, Indianapolis, IN. Thus, a district could spend approximately $515 on 10 units as a low cost cooling aid. In addition, chill sticks may be particularly useful for school foodservice operations with limited staff hours allotted for cooling foods at the end of the work day to meet 2005 *FDA Food Code* cooling standards. Combined methods, such as a chill stick and an ice bath, may help to significantly reduce cooling times. San Jamar, a food safety equipment manufacturer, was planning to launch a new chill stick model (Rapi-Kool® Plus) in September 2008. This product may be filled with water and then frozen, or filled with ice for a ready-to-cool paddle in minutes (San Jamar, personal communication, September 17, 2008). This design eliminates the problem of forgetting to pre-freeze the unit in advance and allows multiple uses throughout the work day.

Of the 450 respondents who responded to the question about the purchase of color-coded cutting board sets, 33% ($n$ = 147) of respondents indicated they had invested in this item. The majority of these respondents ($n$ = 117) had done so prior to the HACCP requirement, as shown in Table 9. Their reasons for purchasing this item may be due to knowledge about this tool as a way to mitigate cross contamination in work operations.

Table 9. *Small Equipment Items Purchased by Districts to Meet HACCP Requirements*

| | Purchased prior to 2004 requirement | | Purchased after 2004 requirement | | Did not purchase | |
|---|---|---|---|---|---|---|
| Item and number of responses | *n* | % | *n* | % | *n* | % |
| Thermometers ($n$ = 468) | 332 | 70.9 | 81 | 17.3 | 55 | 11.8 |
| Chill sticks ($n$ = 456) | 72 | 15.8 | 31 | 6.8 | 353 | 77.4 |
| Color-coded cutting board sets ($n$ = 450) | 117 | 26.0 | 30 | 6.7 | 303 | 67.3 |

McCabe-Sellers and Beattie (2004) stated foods such as lettuce, melons, and strawberries should be included as targets of prevention for foodborne diseases. These foods must be carefully selected, washed, and separated from raw meat and poultry to prevent potential foodborne illnesses. At a 2005 CFP executive board meeting, members of the *Listeria monocytogenes* Intervention Committee recommended the use of color-coded cutting boards, handles on knives, tongs, and utensils as a visual reminder for keeping food contact surfaces that touch raw food separate from those that touch ready-to-eat foods. Findings from this study indicate school districts are responsive to this suggestion, albeit there is a need for continued education about the risks of cross contamination and strategies to mitigate the potential for occurrence. The total of small equipment purchases was computed by adding the number of thermometers, chill sticks, color-coded cutting board sets, color-coded knives, color-coded cleaning and sanitizing buckets, ice transfer containers/buckets, electronic touchless paper towel dispensers, ice packs, shallow pans, optic sensor faucets for handsinks, hands-free foot pedals for handsinks, digitizer hand soap dispensers, nail brushes, hot food merchandisers, soup kettles, and food warmers reported by respondents as purchased for their respective districts. Of 401 respondents, the median number of total small equipment purchases was 42 with a range of 1 to 10,129 items.

Respondents indicated whether any other small equipment items on a given list were purchased to comply with their district's HACCP-based food safety plan. Almost an equal number of respondents indicated they had not purchased these items prior to 2004 ($n$ = 194; 42.9%) as those who indicated that they had purchased these items prior to the requirement (41.6%). Only 15.5% ($n$ = 70) indicated that any of these small equipment items were purchased after the requirement. Respondents ($n$ = 220) were asked to identify how many of

each of these small equipment items had been purchased to comply with the new requirement. Findings are shown in Table 10. One hundred twenty-nine respondents reported that shallow pans was the small equipment item purchased most frequently, with a median purchase per district of 21 pans and a range between 2 and 432. Olds and Sneed (2005)reported that, although the cooling method did not meet recommended FDA two-stage cooling standards, chili con carne with beans cooled at a faster rate in a 2-inch pan than in a 4-inch pan. Shallow pans allow the heat from food to dissipate faster than deeper pans and,

Table 10. *Other Small Equipment Items Purchased by Districts to Meet HACCP Requirements (*N = *220)*

| | Districts that purchased | | Number purchased | | |
|---|---|---|---|---|---|
| Items purchased | *n* | % | *Mdn* | Min | Max |
| Shallow pans (2” deep) | 129 | 59 | 21 | 2 | 432 |
| Color-coded cleaning & sanitizing buckets | 90 | 41 | 12 | 1 | 240 |
| Ice packs | 64 | 29 | 10.50 | 1 | 600 |
| Nail brushes | 72 | 33 | 8 | 1 | 100 |
| Electronic touchless paper towel dispensers | 48 | 22 | 5 | 1 | 135 |
| Color-coded knives | 16 | 7 | 6 | 3 | 79 |
| Ice transfer containers/buckets | 39 | 18 | 5 | 1 | 40 |
| Optic sensor faucets for handsink | 22 | 10 | 3 | 1 | 100 |
| Hands-free foot pedals for handsink | 16 | 7 | 3 | 1 | 102 |
| Digitizer hand soap dispensers | 18 | 8 | 4 | 1 | 20 |
| Hot food merchandisers (tabletop) | 26 | 12 | 2 | 1 | 25 |
| Soup kettles | 34 | 15 | 2 | 1 | 20 |
| Food warmers | 39 | 18 | 4 | 1 | 30 |

thus, can be particularly useful for thick, viscous food items and were recommended as a cooling method in earlier editions of ServSafe® training materials (National Restaurant Association, 2006). Other frequently purchased items by districts were color-coded buckets (*Mdn* = 12), ice packs (*Mdn* = 10.50), and nail brushes (*Mdn* = 8). "Other" write-in responses included: small refrigerator (*n* = 1), pizza warmer (*n* = 1), warming tray (*n* = 1), and hot transport unit (*n* = 1).

Approximately one third (*n* = 146) of the respondents stated there were small equipment items identified as needed in their district's HACCP-based food safety plan but not yet purchased. Seventy percent (*n* = 103) of these respondents said the reason the items had not been purchased was lack of funds in the foodservice department budget (Table 11). Fifty percent (*n* = 73) of respondents said the reason was lack of time to investigate options and make a purchase. "Other" responses (*n* = 9) included: "we are a small school" (*n* = 2),

Table 11. *Reasons Why Small Equipment Items Had Not Been Purchased (*N = *146)*

| Reason[a] | *n* | % |
|---|---|---|
| Lack of funds in foodservice department budget | 103 | 70.1 |
| Time to investigate options and make a purchase | 73 | 49.7 |
| Lack of funds in the district's general fund budget | 29 | 19.7 |
| Administrative approval is needed | 19 | 12.9 |
| Administrators are not aware of need | 12 | 8.2 |
| Lack of electricity | 6 | 4.1 |
| Other | 9 | 6.1 |

[a]Multiple responses given.

"health inspector hasn't mentioned need" ($n$ = 1), and "plan is still being worked on" ($n$ = 1). Over 20% of respondents stated administrative approval is needed or administrators are not aware of need as reasons why small equipment items had not been purchased. School foodservice administrators and/or district administrators may not understand or may not be aware of site-level food safety equipment needs. Lack of understanding or awareness, in conjunction with limited time, may result in increased time and labor costs at the site level due to lack of equipment designed to reduce these costs.

Total large and small equipment purchases per site by size of district (prior to and after the 2004 mandate) were examined. Per site, 90 small districts reported a median of 1 large equipment purchase and 10.25 small equipment purchases. Fifty-one medium districts also reported a median of 1 large equipment purchase but reported 11.33 small equipment purchases per site. Thirty-eight large districts reported a median of 1.16 large equipment purchases and 11.32 small equipment purchases per site. To reduce the likelihood of results being affected by economies of scale, for example large districts purchasing more large and small equipment than smaller districts simply due to number of sites, this calculation used the median purchases per site; thus large districts did purchase more large and small equipment than did small districts per site. Large districts purchased more large equipment than did medium districts, however small equipment purchases were similar.

Districts have identified the need for additional large and small equipment as part of their HACCP-based food safety plan. However, when asked if the district's HACCP plan met evaluation standards by state agencies, 97.5% ($n$ = 232) of respondents reported the district's HACCP plan passed CRE. The question remains: If districts lack proper equipment for HACCP, how did state agencies approve the food safety plan? HACCP requires monitoring

of time and temperature control for safety (TCS) of foods. Through the monitoring process, districts may have become aware of the need of repairs for temperature controlled equipment, or for additional temperature controlled equipment. Equipment designed for cooling foods may be critical, especially if districts have limited staff at the end of the work day. Hot foods that are tightly wrapped then placed directly in a refrigeration unit will not cool rapidly due to lack of cooling surface. Further, the package retains heat, the refrigeration motor becomes overworked, and there is a potential for bacterial growth. There is limited research on how school districts monitor cooling stages. Finally, lack of funds, lack of time, and lack of administrative support may lead school foodservice administrators to feel a lack of job satisfaction, thus less desire to take proactive steps to meet the needs of the program. Thornton (2007) found a weak but significant relationship between USDA Southeast region directors' ($n$ = 304) attitude and program effectiveness. Directors (9%) who did not like their job, or felt it was "just a job" scored lower on the program effectiveness score. An association between level of education and program effectiveness score was also found. The program effectiveness score increased in relation to level of education obtained. Respondents with bachelor's and graduate degrees scored higher on program effectiveness (Thornton, 2007).

School nutrition administrators were asked, "What were the estimated office supply costs to comply with the new requirement to implement HACCP?" Three hundred thirty-two respondents reported the median cost of office supplies was $200, ranging from $0 to $6,000. Recordkeeping is a critical part of HACCP, as it verifies the food safety program is working and provides proof of due diligence in case a school nutrition program is implicated in a foodborne illness outbreak or complaint (NFSMI, 2006). School nutrition programs may use

district funds to pay for office supplies, such as printing, related to HACCP. This could be the reason such low costs were identified. The *School Lunch and Breakfast Cost II Study* (USDA/FNA, 2008a) found that school food authorities often used a variety of resources provided by the school district, such as facilities, equipment, and supplies.

*Facility Renovations and Upgrades*

Respondents were asked to indicate what large equipment items (greater than $500 expenditure) they would include in budgets to improve their HACCP-based food safety programs if future renovations were planned for foodservice sites in their districts. Almost half (49.8%; *n* = 230) of the respondents stated they did not have any renovations planned (Table 12). Of 232 who indicated renovations were planned, the items identified most frequently for inclusion were refrigerated display cases (*n* = 115), pass-through warmers or hot holding cabinets (*n* = 109), pass-through refrigerators (*n* = 107), and air conditioners for dry storage (*n* = 100). One trend in school meals programs is movement away from traditional linear serving lines to a retail approach, with grab-and-go lines for cold food display and service ("Designing School Foodservice Facilities," 2008). Research has shown that 75% (*n* = 532) of school districts reported use of convenience entrée items, such as pizza, 75% or more of the time (Hanna, 2008). Planned purchases identified by respondents in this study support the observed trend toward a retail concept in school meal programs.

New hand sinks were identified by 33% (*n* = 77) of the respondents as a planned purchase in upcoming renovations. Failure to wash hands has been cited in a number of foodservice food safety studies (Giampaoli, Cluskey, et al., 2002; Gilmore, Brown, & Dana, 1998; Paez, Strohbehn, & Sneed, 2007; Sneed, Strohbehn, & Gilmore, 2004; Strohbehn, Sneed, Paez, & Meyer, 2008). In the *Food Establishment Plan Review Guide* (FDA/CFP,

Table 12. *Large Equipment Items Needed for Inclusion in District's Future Budget to Improve HACCP Program (*N = *462)*

| Large equipment items needed[a] | *n* | % |
|---|---|---|
| No renovations planned | 230 | 49.8 |
| Refrigerated display cases | 115 | 49.0 |
| Pass-through warmers or hot holding | 109 | 46.9 |
| Pass-through refrigerators | 107 | 46.0 |
| Air conditioner for dry storage | 100 | 43.1 |
| Refrigerated milk coolers | 83 | 35.7 |
| Storage areas | 81 | 34.9 |
| Hot display cases | 79 | 34.0 |
| Hand sinks | 77 | 33.1 |
| Dishmachine | 75 | 32.2 |
| Other | 40 | 17.2 |

[a]Multiple responses given.

2000), it is recommended that handwashing sinks be located within 25 feet of a work station and located in each food preparation and warewashing area. The 2005 *FDA Food Code* states a handwashing sink shall be located to allow convenient use by employees in food preparation, food dispensing, and warewashing areas and in or near toilet facilities. Paez et al. found through in-depth observations at five retail outlets (delicatessens) in the Midwest that employees were not practicing proper handwashing. Eighteen employees were observed and handwashing frequencies and techniques were recorded. Findings indicated handwashing frequency was not adequate, and handwashing techniques not completed according to food code, however this study did not determine if number and availability of hand sinks was

correlated to frequency of handwashing. Future research should identify if the availability of and ease of access to handsinks is related to how many times an employee washes his/her hands.

Over 30% ($n$ = 75) of respondents would purchase dishmachines when budgeting for large equipment in planned, future renovations. This finding is somewhat surprising as recent research has shown an increase in the use of disposables (Hanna, 2008). Hanna reported that 50% of districts ($n$ = 527) reported using disposables 75% or more of the time. Other write-in responses to the question in this study about what large equipment items would be purchased for future renovations included: walk-in freezer ($n$ = 9), blast chiller ($n$ = 5), central warehouse freezer ($n$ = 2), freezer/cooler alarms ($n$ = 1), and temperature monitoring equipment ($n$ = 1). For the present study a quote of $7,270 for a full-size, double-door, stainless steel exterior, pass-thru warmer was obtained from Zesco Wholesale Food Service Equipment & Supplies, Indianapolis, IN.

Another survey question asked: "If future renovations are planned for foodservice sites, what infrastructure upgrade or repairs need to be budgeted to improve HACCP program?" More than half (52.1%; $n$ = 234) of the respondents to this question ($n$ = 449) stated they did not have any renovations planned for infrastructure upgrades or repairs (Table 13). Electrical, ventilation, plumbing, or lighting systems were identified as the greatest needs of those who did indicate upgrades were needed to improve their district's HACCP program ($n$ = 215). Approximately the same percentage of respondents indicated that replacement of ceiling (46.5%) and floor tiles (45.5%) was needed. As previously stated, the 1995 GAO report on school facilities and the 2000 U.S. Department of Education's *Condition of America's Public School Facilities* report indicated top infrastructure needs

Table 13. *Infrastructure Upgrades/Repairs Needed for Inclusion in Future District's Renovations to Improve HACCP Program (*N = *449)*

| Upgrade/repair needed[a] | *n* | % |
|---|---|---|
| No renovations planned | 234 | 52.1 |
| Electrical upgrades | 138 | 64.1 |
| Ventilation upgrade | 128 | 59.5 |
| Plumbing upgrades | 115 | 53.4 |
| Replace ceiling tiles | 100 | 46.5 |
| Replace floor tiles | 98 | 45.5 |
| Lighting upgrades | 92 | 42.7 |
| Cracks in walls | 44 | 20.4 |
| Cracks in foundation | 36 | 16.7 |
| Other | 28 | 13.0 |

[a]Multiple responses given.

were heating and air conditioning, plumbing, roofs, and electrical power. Other write-in responses to the question on this survey included: air conditioning ($n$ = 5) and separate exit for garbage removal (instead of through the kitchen; $n$ = 1). Although additional freezer space was not defined as an infrastructure upgrade or repair item in this study, five respondents identified this as a needed upgrade. Child Nutrition funds may be used only for the operation or improvement of the foodservice operation. School food revenues may not be used to purchase land or buildings, or to construct buildings. Allowable costs include salaries, benefits, food (except foods of minimum nutritional value), supplies, purchased service, equipment, and indirect costs. In addition, Child Nutrition funds may not be used to

pay for any debts, fines, penalties, entertainment, and personal memberships (USDA, 2003). Therefore, school food administrators must appeal to the school district for infrastructure upgrades. Because *FDA Food Code*s specify infrastructure requirements for foodservice establishments, including ventilation; plumbing; and ceiling, walls, and floors, districts have a legal responsibility to comply with terms of their license. CNPs may have to appeal to the school district's general fund for these upgrades, thus taking it out of the school nutrition administrator's control.

*Organizational Inputs*

*Training.* Respondents ($n$ = 447) were asked if site-level foodservice assistants had received more food safety training during the school years following 2004–2005 than in years prior. Results are shown in Table 14. For school year 2004–2005, 52.0% ($n$ = 226) of respondents stated their assistants had not received more training than in prior years. However, for school years 2005–2006 and 2006–2007, 72.7% ($n$ = 322) and 81.1% ($n$ = 360), respectively, of respondents stated that assistants had received more food safety training than in years prior to 2004. The USDA/FNS (2005b) *Guidance for School Food Authorities: Developing a School Food Safety Program Based on the Process Approach to*

Table 14. *Food Safety Training Received by District's Site-level Foodservice Assistants in School Years Before and After the 2004 Reauthorization Act (*N = *447)*

| | District staff received more training than in years prior to 2004–2005 | | District staff did not receive more training than years prior to 2004–2005 | |
|---|---|---|---|---|
| School year | *n* | % | *n* | % |
| 2004–2005 | 209 | 48.0 | 226 | 52.0 |
| 2005–2006 | 322 | 72.7 | 121 | 27.3 |
| 2006–2007 | 360 | 81.1 | 84 | 18.9 |

*HACCP Principles* was issued to state departments and made available to school districts in June 2005, approximately 1 year after the Reauthorization Act of 2004 requiring HACCPimplementation. It is possible that the majority of school districts postponed HACCP-related food safety training until guidance was received.

Additionally, 446 respondents indicated whether site-level foodservice managers had received more food safety training as a result of the Reauthorization Act of 2004 (Table 15). For all three school years in question, the majority of respondents reported that the district's site-level managers had received more food safety training than in prior years, with 57.2%, 76.2%, and 80.7% responding affirmatively for each of the respective years. The changes of percentages with the passing years suggest greater awareness of the need to train site-level managers, as these individuals are responsible for the oversight of site-level employees. Almost 50% of site-level managers ($n$ = 268) surveyed by the National Foodservice Management Institute (NFSMI, 2005) reported their role in the district's HACCP program included coaching foodservice personnel on a daily basis. Strohbehn, Gilmore, and Sneed (2004) reported the highest rated food safety concerns of dietary managers ($n$ = 73) in knowledge about handwashing, and lack of handwashing practices. Although there was an

Table 15. *Food Safety Training Received by District's Site-level Foodservice Managers in School Years Before and After 2004 Reauthorization Act (*N = *446)*

| | Managers received more training than in years prior to 2004–2005 | | Managers did not receive more training than years prior to 2004–2005 | |
|---|---|---|---|---|
| School year | *n* | % | *n* | % |
| SY 2004–2005 | 246 | 57.2 | 184 | 42.8 |
| SY 2005–2006 | 337 | 76.2 | 105 | 23.8 |
| SY 2006–2007 | 356 | 80.7 | 85 | 19.3 |

increase in food safety training reported by respondents in the present study for both site-level managers and employees, of concern is the number of respondents who reported that managers and site-level employees had not received more training during the three years after the mandate. It is possible that these districts implemented HACCP prior to 2004 and training had previously been conducted, or the same amount of training was conducted, thus additional training was not warranted. NSFMI (2005) found that of the 398 schools that reported implementing HACCP, 30% began the program more than 3 years prior to 2005.

The survey included questions about credentials and certifications held by foodservice personnel in the districts. The majority (76.7%, $n$ = 446) of responding districts reported that site-level foodservice managers held a current food safety certificate approved by CFP. Encouragingly, this number has increased since the 2005 NFSMI study, *HACCP Implementation in K-12 Schools,* which found 67% ($n$ = 391) of managers responding to this question held CFP certification. Almost 75% ($n$ = 345) of respondents to this question indicated the CFP certification was not a result of the requirement to implement HACCP. Reasons given for CFP certification were: required by state agency (51.3%; $n$ = 135); required by the school district (28.5%; $n$ = 75), or "other" (20.2%, $n$ = 53). Write-in responses included comments such as: required by city or county sanitation ($n$ = 9), required by contract management company ($n$ = 9), continuing education units (CEUs) for the SNA ($n$ = 2), and importance for safety of customer ($n$ = 2). Thus, increases in CPF certification may not be a result of the new requirement to implement HACCP, but driven by state health agency or local regulations or organizational requirements. Sneed et al. (2004) stated that food safety education should be a priority, because operations with food safety certified employees were more likely to practice appropriate food safety behaviors.

In school year 2005–2006, respondents ($n$ =392) reported that a median of 12 site-level foodservice assistants were trained on food safety for 8 hours. These assistants were paid a median hourly wage of $9.00, with ranges reported from $5.75 to $15.15, as shown in Table 16. Based on the median hourly wage, cost per assistant was calculated to be $72 per site-level foodservice assistant. Thus, based on estimates from this study, a district's investment was approximately $865 for food safety training during school year 2005–2006 for site-level foodservice assistants (12 assistants training for 8 hours at an hourly rate of $9.00). Respondents were asked their level of agreement to the statement: "There was an increase in the amount of food safety training provided to site-level foodservice workers due to the new requirement to implement HACCP," using a 5-point Likert-type scale ranging from 1 = *Strongly disagree* to 5 = *Strongly agree*. Over 50% ($n$ = 216) of respondents to this question reported they agreed (4 on the 5-point scale), and 20.0% ($n$ = 83) reported that they

Table 16. *Districts' Food Safety Training and Hourly Wage for Site-Level Foodservice Assistants and Managers During School Year 2005–2006*

| Type of employee | No. of districts responding | *Mdn* | Min | Max |
|---|---|---|---|---|
| District foodservice assistants | 391 | | | |
| Number trained | | 12 | 0 | 800 |
| Hourly wage | 379 | $9.00 | $5.75 | $15.15 |
| Food safety training hours | 374 | 8 | 0 | 215 |
| District foodservice managers | 379 | | | |
| Number trained | | 4 | 0 | 325 |
| Hourly wage | 360 | $12.00 | $7.00 | $25.00 |
| Food safety training hours | 350 | 1 | 0 | 60 |

strongly agreed with the statement, with a mean rating of 3.73 (*SD* = 1.09). The mean identified in this question supports the findings reported earlier that site-level employees did receive more food safety training as a result of the 2004 federal mandate.

During the same school year (2005–2006), respondents reported that a median of four managers per district received 10 hours of food safety training. These managers were paid a reported median hourly wage of $12.00; with a range from $7.00 to $25.00 (see Table 16). Based on the median hourly wage, cost for training was calculated to be $120 per site-level foodservice manager. Thus, based on estimates from this study, a district's investment of time for food safety training for foodservice management was approximately $500 during school year 2005–2006. Findings from this study suggest that the total labor cost per district for training both management and staff was approximately $1,350. Respondents were asked their level of agreement to the statement: "There was an increase in the amount of food safety training provided to site-level managers due to the new requirement to implement HACCP," using a 5-point Likert-type scale ranging from 1 = *Strongly disagree* to 5 = *Strongly agree*. Approximately 50% (*n* = 206) of respondents reported they agreed (4 on the 5-point scale), and 24.2% (*n* = 100) reported that they strongly agreed (5 on the 5-point scale) with the statement, with a mean rating of 3.8 (*SD* = 1.05). Again, the mean rating reported for this question supports the earlier finding that site-level managers did receive more food safety training as a result of the 2004 federal mandate.

About two thirds of respondents (*n* = 267) reported district's foodservice staff conducted the food safety training course(s) (see Table 17). Other frequent providers of food safety training were: state or local level health department (*n* = 171), state departments of education (*n* = 162), and the SNA (*n* = 142). These findings are consistent with previous

research that reported providers of HACCP training, listed in order by frequency of training, as: district personnel, local health department, SNA, and state departments of education (NFSMI, 2005). In this study, USDA extension service was identified by only 17% ($n$ = 68) of respondents; however this is an increase from the 4% ($n$ = 268) reported in the national study conducted by NFSMI in 2005. Almost 40% of respondents used food or supply vendors ($n$ = 77) or for-profit trainers ($n$ = 75) to provide food safety and/or HACCP-based training. NFSMI (2005) did not inquire about these providers, however 9% ($n$ = 268) of respondents in their study identified "other." It is possible "other" consisted of vendors and for-profit trainers. For example, SFSPac®, a sanitation and chemical service company targeted at school foodservice, provides ServSafe® training at no additional charge to customers and may account for some of the other sources of training.

Table 17. *Providers of Food Safety Training and/or HACCP-Based Training for School Districts Identified by Responding District Foodservice Administrators (*N = *404)*

| Provider[a] | *n* | % |
|---|---|---|
| District foodservice staff | 267 | 66 |
| State or local level health department | 171 | 41 |
| State department of education | 162 | 40 |
| School Nutrition Association (state or local levels) | 142 | 35 |
| Food or supply vendor | 77 | 19 |
| For-profit trainer or provider organization | 75 | 19 |
| USDA extension service (state or local levels) | 68 | 17 |
| Other | 38 | 9 |

[a]Multiple responses given.

Two thirds ($n$ = 267) of the respondents identified district foodservice staff as providing food safety training, yet almost 45% ($n$ = 567) of the respondents in this study did not have a college degree, although 75% ($n$ = 204) did hold a CFP certificate. Although it may be cost effective for school foodservice staff to provide some types of training, there is no school food safety and/or HACCP trainer certification, thus the content and accuracy of the training information lie in the hands of each trainer, possibly allowing for inconsistencies.

Respondents were asked the estimated total costs or fees of these trainings. The median cost or fee for training of both managers and foodservice assistants reported by 295 respondents was $500, with a minimum of $75 ($n$ = 2) and a maximum of $50,000 ($n$ = 1). In reviewing the $50,000 response from the USDA Southwest region to find out if the district had used a for-profit trainer, labor costs for manager and staff food safety training were calculated at only $5,000 for this district. It is uncertain why such a large amount was reported as spent on training. This response may have been an input error by the respondent.

Respondents indicated topics of the trainings provided to school foodservice program staff between the beginning of school year 2004 and the end of school year 2006. Over 90% of the 401 respondents to this question indicated topics of safe cooling and holding temperatures, food safety principles, personal health and hygiene, and time and temperature abuse were included in the training sessions for their staff (Table 18). “Other” training topics identified ($n$ = 20) included: chemical use ($n$ = 2), ServSafe® ($n$ = 2), first-aid ($n$ = 1), foodborne illness ($n$ = 1), local health department regulations ($n$ = 1), vermin and bacterial infections ($n$ = 1), and allergies ($n$ = 1). Four respondents stated specific SOPs related to overall food safety topics, such as time and temperature abuse. Interestingly, allergy training

Table 18. *Number and Percentage of Topics of Staff Food Safety Training Sessions Identified by Districts for School Years 2004–2006 (*N = *401)*

| Topic[a] | *n* | % |
|---|---|---|
| Safe cooling and holding temperatures | 379 | 95 |
| Food safety principles | 378 | 94 |
| Personal health and hygiene | 377 | 94 |
| Time and temperature abuse | 366 | 91 |
| Critical control points | 348 | 88 |
| Standard operating procedures | 347 | 87 |
| HACCP documentation | 345 | 86 |
| Corrective action procedures | 318 | 79 |
| Process approach to HACCP | 312 | 78 |
| Other | 20 | 5 |

[a]Multiple responses given.

was identified by one district. It has been reported that 2 to 8 percent of children have incidences of food allergies, compared to adult ranges of 1 to 2 percent (Helm & Burks, 2000). The Food Allergy & Anaphylaxis Network (2008) recommended that all staff who interact with students on a regular basis understand food allergies, be able to recognize symptoms, and know what to do during an emergency. CDC (2007) reported in the "School Health Policies and Programs Study" (SHPPS) that 90% of school districts ($n$ = 449) and 98% of school buildings ($n$ = 1,029) required information about food allergies to be kept in a student's permanent record. Only 52% of states ($n$ = 51) in the SHPPS study required this information to be obtained and kept in student records, but almost 50% of the states provided

funding to school districts offering training on severe food or other allergens (CDC, 2007). The 2005 *FDA Food Code* requires the "person-in-charge" of a foodservice operation to be able to demonstrate knowledge of foods containing major allergens and the symptoms of an allergic reaction. School foodservice administrators may want to provide training on allergens, in addition to information received through CFP training.

*Standard operating procedure(s) inputs.* Respondents were asked to identify members of the HACCP team who were primarily responsible for writing the district's original HACCP-based SOPs. Approximately three fourths of the 399 respondents to this question ($n$ = 305, 76.4%) reported the district's foodservice director was primarily responsible for writing the procedures (Table 19). Only 30% ($n$ = 120) of respondents indicated foodservice managers were mostly responsible for writing the procedures. "Other" write-in team members ($n$ = 45) included: consultant ($n$ = 10), contract management company representatives ($n$ = 5), superintendent ($n$ = 4), school nurse ($n$ = 3), administration ($n$ = 2), state agency ($n$ = 2), board of education ($n$ = 2), dietetic interns ($n$ = 1), and

Table 19. *Primary Developers of District's SOPs for HACCP Plan (*N = *399)*

| Member[a] | *n* | % |
|---|---|---|
| District's foodservice director | 305 | 76.4 |
| Foodservice managers at site level | 120 | 30.1 |
| District's supervisors, coordinators, trainers | 57 | 14.3 |
| District's assistant/associate foodservice director | 48 | 12.0 |
| Foodservice hourly employees | 31 | 8.0 |
| Other | 45 | 11.3 |

[a]Multiple responses given.

warehouse manager ($n$ = 1). HACCP-based plans are required to be site- specific and customized based on the individual operation's food production processes (NFSMI, 2006; USDA, 2005). There may be a dis-connect between corporate office representatives of contract management companies and school foodservice administrators. Thus, site-specific food safety needs may not be met. Respondents indicated the median number of labor hours spent writing these procedures was 40, with a range of 4 to 2,000 hours. It is possible one reason for the relatively low median of labor hours spent writing SOPs was due to existing resources. SOP templates are available through a number of organizations, including Iowa State University (ISU) Hazard Analysis Critical Control Point Information Center, NFSMI, and various state agencies. HACCP plan developers were able to download and modify/edit these SOP templates according to local requirements, which should have reduced development and writing time. Several organizations (SNA, NFSMI, ISU Extension) produced HACCP-based training materials for schools and recommended that school districts' HACCP teams comprise various levels in the organization, including managers and other site-level employees. Unfortunately, findings from the present study show managers were included in developing SOPs only 30% of the time and hourly employees were included only 8% of the time. The median hourly wage reported for HACCP plan developers was $18.00, ranging from $7.00 to $300.00 per hour. It is unclear if the $300.00 is the estimated average of team members or if the respondent provided total hourly wages of all team members, thus this response may be an input error by the respondent. The median hourly wage was multiplied by the reported 40 median number of hours to develop, and the district's cost was calculated at approximately $720 for each member of the HACCP team; thus the greater number of team members, the greater the cost. For example, this study identified 606

HACCP team members, which when multiplied by the median cost per hour ($18), then multiplied by the median number of labor hours (40), and divided by the number of districts (*n* = 399), produced a total of approximately $1,100 for development of SOPs per district. The number of nonrespondents to this question was 168. A small number of respondents (*n* = 77) indicated the use of consulting services to develop the district's HACCP plan. Two thirds (*n* = 52) of respondents had consultants write their SOPs, and 74% (*n* = 57) used consultants in the development of HACCP monitoring logs or documentation forms (Table 20). In addition, consulting fees reported by respondents ranged from $250 to $30,000. Although few respondents indicated a consultant was hired, when they were asked the open-ended question: "What would you have done differently if cost were not an object and hindsight were 20/20?" approximately 30% (*n* = 254) of respondents indicated they would have hired a consultant to write the plan.

Table 20. *Consulting Services Used in Development of District's HACCP Plan (*N = *77)*

| District use of consulting service[a] | *n* | % |
|---|---|---|
| Provided HACCP or food safety training | 61 | 79.2 |
| Developed HACCP monitoring logs or documentation forms | 57 | 74.0 |
| Wrote standard operating procedures | 52 | 67.5 |
| Recommended action steps to implement the food safety plan | 44 | 57.1 |
| Identified critical control points for recipes | 42 | 54.5 |
| Conducted site evaluations (hazard analysis reviews) | 36 | 46.8 |

[a]Multiple responses given.

*Staffing inputs.* Respondents were surveyed to see if more staff were hired as a result of the new requirement to implement HACCP. Most respondents (95.4%; *n* = 392) indicated district foodservices had not hired more staff. Of the respondents whose districts did hire more staff (*n* = 20), the median number of site-level foodservice assistants hired was 1 and a maximum of 31 new assistants reported. Twenty respondents reported hiring district-level (management) foodservice staff as a result of the new requirement to implement HACCP. The median annual salary was $16,320, ranging from $8,000 to $56,000. The reported median hourly wage rate for the new foodservice assistant position was $8.65, ranging from $7.00 to $20.00. Thus, district investment in a new full-time staff member at 6 hours per day (J. Boettger, personal communication, September 3, 2008) multiplied by the median hourly rate results in a daily total of $52. Wilson (2007) found that 63% (*n* = 625) of school foodservice assistants in the USDA Midwest region worked between 4 and 7 hours per day, however respondents were not surveyed to find out if they were considered full time or part time by their districts and whether their classification included benefits. Some school districts offer benefits to hourly employees working less than 8 hours per day. With an estimated 22.4% of the labor cost added for benefits and an total of 180 work days annually, a total labor expense of approximately $11,500 per site-level foodservice assistant was calculated (Northwestern University, 2008).

In the GAO (2003b) report, *School Meal Programs: Revenue and Expense Information from Selected States*, labor was reported to have increased from 43% to 44% of the total school foodservice budget while food costs had decreased. GAO researchers conducted telephone interviews with each state agency representative administering the school meals program, as well as two site-level managers operating programs that revenues

did not cover expenses. Perhaps in an effort to reduce labor costs, districts have reduced staff numbers; not replaced employees who retired; switched to use of disposable ware; and serve more prepackaged or convenience foods that require less preparation and, thus, less labor (Hanna, 2008). Three state child nutrition directors reported in the GAO study that school districts were replacing full-time staff with part-time staff in order to reduce salary and benefits expenses (GAO, 2003b). Due to rising food costs, school foodservice programs may try to further reduce labor costs in an effort to maintain financial stability. For example, GAO (2003a) reported that some school foodservice administrators did not replace expensive equipment like dishmachines; instead they switched to disposables to keep labor costs down. The trend to use disposables is reflected by labor shortages and concerns of food safety (Hanna). Finally, rising labor costs may have contributed to very few staff being hired as a result of the federal HACCP mandate, and rising food costs may force school districts to continue the trend of reducing labor hours and the number of staff. Rice (2007) and Hanna (2008) found that use of contract management services has increased since 1989. It is possible that school districts contract out support services such as child nutrition and transportation due to the complexities of the programs plus labor shortages and increased food costs and increasing responsibilities, such as HACCP implementation and Wellness Policy formation.

*Health inspections.* Respondents were asked if there had been an increase in the cost of obtaining the two federally mandated health inspections for each operation. Of 413 respondents, most (81.4%) replied there had not been additional costs. The annual cost paid by responding districts to obtain the required number of health inspections for each site where food is prepared or served ranged from $25 to $5,125. However, the increased

inspection requirements have presented state health inspection agencies with a greater work load without resources to complete it. In some states, this issue of how the increased inspection costs will be covered is becoming political. Schools in Michigan were exempt from paying fees to local health departments for health inspection reports (State of Michigan, 2007). Effective January 2008, legislation was passed in an effort to reduce the resource challenges faced by local health departments. Schools would be assessed a fee determined by the school district and local health department. Michigan School Business Association officials were consulted regarding this change. Schools in Michigan are not considered nonprofit under state law. School foodservice operations were assessed fees of up to $500 per kitchen for the second annual inspection required as part of the Child Nutrition and WIC Reauthorization Act of 2004 (*"*School Kitchen Inspection Fee Passes the House," 2008). In response to this increased financial burden on school districts, the School Kitchen Inspection Fee Compromise bill (HB-5951) was passed on June 26, 2008, in the Michigan House of Representatives. HB-5951 states, "School foodservice authorities recognized by the Michigan Department of Education should not be charged annual licensing, inspection, and certification fees in excess of $100.00 per main district kitchen and no more than $50.00 for each satellite unit within the district." This compromise is currently in the Michigan Senate Agriculture Committee.

Survey respondents identified providers of health inspections for their districts' foodservice production and service sites. Approximately three fourths of 411 respondents (74.2%; $n = 304$) reported that the local health department provided inspections, followed by 29% ($n = 119$) of respondents who indicated inspections were conducted by the state's health department, whereas private, for-profit companies were identified by two districts as health

inspection providers. “Other” write-in responses (*n* = 8) included: department of agriculture, county health department, and other outside agency. Variation may be due to food safety regulations established by individual state agencies. When respondents (*n* = 406) were asked if their HACCP plans had been evaluated by their state agency (as required in the 2004 Reauthorization Act), 57.9% (*n* = 235) indicated, “Yes,” and of these respondents, 97.5% reported their HACCP plans had been approved. As noted previously, no evaluation criteria were provided by USDA for state agencies to use as guidance in reviewing district HACCP plans. Thus, the high percent of approvals may be due to lack of understanding by reviewers.

*Perceptions of Respondents About HACCP Implementation and Effectiveness*

*Challenges.* An open-ended survey question, “What do you perceive to be the greatest, overall challenges with implementation of your district’s HACCP-based food safety plan?” was answered by 292 respondents. The top five challenges identified were time (*n* = 85), paperwork (*n* = 47), training (*n* = 38), money (*n* = 37), and staff buy-in/changing behaviors (*n* = 33). These findings are consistent with those from other studies involving school foodservice directors, such as the national study conducted by Giampaoli, Sneed, et al. (2002) in which 461 school foodservice directors identified resources and concerns of employees accepting change as two challenges to improving food safety. At the time of the Giampaoli, Sneed, et al. study, the HACCP mandate had not been passed, and most directors had not yet implemented HACCP and thus may have been unaware of the time and the paperwork involved, the top two greatest challenges found in the current study. There could be a relationship between time and cost challenges identified in this study. Time challenges may be a cost factor due to lack of staffing in school meal programs because of districts’ budgetary constraints and attempts to reduce labor costs. In 2002, Youn and Sneed surveyed

a national sample of school foodservice directors, all school foodservice directors in Iowa, and known directors of centralized operations ($n$ = 414). Of the 22% ($n$ = 91) of respondents who had implemented HACCP, lack of resources and lack of employee training were identified as the biggest challenges or barriers to HACCP. NFSMI (2005), in its national study of site-level managers, reported that lack of resources (such as time and personnel) was identified as the greatest barrier to implementing HACCP. One respondent in the present study wrote this comment: "Please let someone know they need to make school administrators be required to do more and get more information about how important our jobs are." This statement illustrates the recurrent theme found in this study: lack of awareness by administrators about child nutrition and the importance of administrative support for these programs.

*Reflections.* Another open-ended question, "If hindsight is 20/20 and cost was no object, what would you have done differently in implementing your food safety program?" was answered by 254 respondents. As previously discussed, almost 30% of these respondents ($n$ = 73) reported an outside consultant would have been hired to write the district's HACCP plan. Eighteen percent ($n$ = 46) of these 254 respondents stated they would not do anything differently in implementing the district's HACCP plan. The remaining top five responses to the question about what would have been done differently were "conducted more training" ($n$ = 37), "purchased more equipment" ($n$ = 26), and "purchased a computerized system to take and record temperatures" ($n$ = 13). Recognizing the identified constraint of limited money, districts may have wanted to conduct more training, purchase more equipment, etc., but could not afford to do so. One respondent stated, "I would purchase blast chillers. The cooling of food has been a challenge. Leftovers from lunch are placed in shallow pans and

cooled according to our SOP, but we are never able to document the final temperature because staff must leave for the day before the food reaches the correct temperature. A blast chiller would allow staff to know that 41°F is reached before leaving for the day."

*Impact.* Two additional open-ended questions were included in the survey. The first question asked, "Do you think your district's investment in a HACCP-based food safety plan has resulted in safer food served to children in your district?" Over 300 respondents answered this question, however only 258 specifically stated, "Yes" ($n$ = 165), or "No." ($n$ = 93). Responses such as maybe, probably, slightly, and somewhat ($n$ = 11) were included in the "yes" category, whereas responses in the negative (such as probably not and not really; $n$ = 14) were included in the "no" category. Other responses ($n$ = 26) to these questions included "don't know," "don't have a clue," and "no comment," and, thus, were not included in the analysis. Almost 65% ($n$ = 176) of respondents thought the district's investment in a food safety plan resulted in safer food served to children. When asked, "Why is it safer?" 108 respondents indicated staff were more aware of need for food safety practices. One respondent wrote: "The comprehensive nature of the HACCP plan makes food safer and gives the cafeterias a greater sense of legitimacy when dealing with school officials or the public, plus a greater paper trail that gives people more confidence in the program." Surprisingly, 38% ($n$ = 107) of respondents stated HACCP had not resulted in safer food served to children in their districts. However, when asked, "Why is it not safer?" over half of these respondents ($n$ = 57) stated, "We were already serving safe food." This finding indicates schools had perceived that they were implementing and practicing proper food safety requirements despite any federal mandate to implement a formal food safety program.

The second question asked, "Do you think the HACCP requirements have resulted in safer food served to children nationally?" Almost 300 respondents answered this question, however only 169 stated specifically "Yes" ($n$ = 150) or "No" ($n$ = 19). Responses such as "maybe," "probably," "slightly," and "somewhat" ($n$ = 55) were included in the "yes" category, whereas "probably not," and "not really" ($n$ = 8) were included in the "no" category. I was unable to interpret whether other responses ($n$ = 62) to these questions (i.e., "don't know," "not sure," "no comment," "no way of knowing," and "don't have a clue") were intended as positive or negative, so the analysis is based on results from 232 responses. Almost 90% ($n$ = 205) of respondents thought HACCP had resulted in safer food served to children nationally. Again, staff being more aware of need for safe food handling was identified by over 15% ($n$ = 32) of the respondents as the reason food was safer. Only 11% ($n$ = 27) thought that HACCP had not resulted in safer school food. Reasons given were: food was safe prior to requirement ($n$ =9), not all schools are following guidelines ($n$ = 5), people are not really following SOPs ($n$ = 1), and staff turnover is high ($n$ = 1). One respondent stated, "The food is safer because it's all pre-processed when we receive it. Schools don't cook anymore." As stated earlier, recent research has found that the use of convenience and precooked foods has increased (Hanna, 2008). Thus, the majority view of those directly involved with school meals programs is that the resources devoted to HACCP implementation in school districts have resulted in safer food served to children both locally and nationally. Although there is the perception that the federal mandate has resulted in safer food served to children in the NSL and NSB programs nationally, statistics have not been compiled and reported for foodborne illness associated with school foodservice operations since the GAO 2003 study nor since implementation of HACCP in school meal programs in

the fall of 2006. Most surveillance data reports lag by 1 to 2 years. The 2003 GAO report recommended separate tracking of foodborne illness in schools and foodborne illness in school foodservice operations. The most recent 2006 CDC surveillance report contains only one category for foodborne illness in schools, therefore illness associated with school foodservice cannot be determined.

*Comparisons Among Districts*

Comparisons were made based on respondents' year of CRE, USDA region, educational level, size of school district, and years of school foodservice experience. Differences between groups of respondents were identified using the following variables: large equipment purchases, small equipment purchases, food safety training hours per site-level foodservice assistant during school year 2005–2006, food safety training hours per site-level manager during school year 2005–2006, and annual costs by respondent's district to obtain required number of health inspections for each operation where food is prepared or served. Because past CNP research has found significant differences between districts in the Southeastern region and other USDA regions (Hanna, 2008; Longley, 2007; Nettles & Gregoire, 2000; Rice, 2007; Thornton, 2007), post hoc testing included this region. Longley found that the Southeast region had a significantly stronger school characteristic attitude dimension about school wellness policies than did Mountain Plains or Midwest regions. Dimension of attitude included nutrition guidelines, employee responsibility for implementation of wellness policy, top priority for community, and current resources adequate for implementation. Nettles and Gregoire found that school districts in the Southeast region reported the highest percentage (22%, $n = 18$) of conventional onsite production kitchens in the seven USDA regions. Hanna reported Southeast region schools

used fewer convenience entrées than did Midwest and Western region schools. Thornton found that the school districts in the Southeast region had several characteristics that distinguished them from the other six USDA regions: meal participation was higher and most states had requirements for the school nutrition administrator position. Georgia and Florida require district school nutrition administrators to hold master's degrees, and Alabama requires a bachelor's degree. Further, districts in the Southeast appeared to be double the size of school districts in other USDA regions. Rice (2007) conducted a study to compare school foodservice directors' satisfaction with current purchasing methods and prices paid for product between cooperative purchasing members and nonmembers. In her study, 185 districts in the Southwest and Southeast reported the highest percentage (61% and 49%, respectively) of memberships in cooperatives. Purchasing cooperatives may provide exposure to new products and operational inputs to school foodservice operators which could impact food safety related inputs.

*Do respondents differ significantly on identified dependent variables based on their year of CRE?* Respondents chose one of the following school years to identify the year of their district's scheduled CRE: 2007–2008, 2008–2009, 2009–2010, 2010–2011, 2011–2012, or don't know. No significant differences among groups by year of CRE were reported for any of the variables.

*Do respondents differ significantly on identified variables based on their USDA region?* Among respondents in different USDA regions, significant differences existed for three variables: total small equipment purchases, $H(6) = 34.84$, $p < 0.001$; number of food safety training hours per site-level manager, $H(6) = 15.73$, $p = 0.02$; and annual costs for health inspections, $H(6) = 64.71$, $p < 0.001$ (see Table 21). Post hoc testing for total

equipment purchases compared respondents from the Southeast region to those from the Mountain Plains and Western regions. Because two comparisons were computed, the alpha level for each comparison was 0.025 using a Bonferroni correction of 0.05/2. Respondents from the Southeast region purchased significantly more small equipment items (*Mdn* = 69.50) than did respondents from the Mountain Plains region (*Mdn* = 23.50; *U* = 712.00, *p* <

Table 21. *Kruskal-Wallis Test on Dependent Variables Based on Respondents' USDA Region*

| Dependent variable | *H* | *df* | *p* | *Mdn* | Min | Max |
|---|---|---|---|---|---|---|
| Total small equipment purchases | 34.84 | 6 | <0.001 | | | |
| Northeast (*n* = 48) | | | | 64.00 | 3 | 1,450 |
| Mid-Atlantic (*n* = 36) | | | | 68.00 | 4 | 1,358 |
| Southeast (*n* = 52) | | | | 69.50 | 12 | 2,002 |
| Midwest (*n* = 68) | | | | 34.00 | 3 | 3,610 |
| Southwest (*n* = 53) | | | | 58.00 | 4 | 6,862 |
| Mountain Plains (*n* = 58) | | | | 23.50 | 2 | 5,185 |
| Western (*n* = 49) | | | | 26.00 | 2 | 10,129 |
| Food safety training hours per site-level manager | 15.73 | 6 | 0.02 | | | |
| Northeast (*n* = 43) | | | | 10.00 | 0 | 50 |
| Mid-Atlantic (*n* = 33) | | | | 12.00 | 0 | 45 |
| Southeast (*n* = 48) | | | | 12.00 | 2 | 48 |
| Midwest (*n* = 66) | | | | 6.00 | 0 | 40 |
| Southwest (*n* = 46) | | | | 10.00 | 3 | 50 |
| Mountain Plains (*n* = 58) | | | | 8.00 | 0 | 40 |
| Western (*n* = 48) | | | | 10.00 | 0 | 60 |
| Annual costs (in dollars) for health inspections | 64.71 | 6 | <0.001 | | | |
| Northeast (*n* = 33) | | | | 0 | 0 | 3,000 |
| Mid-Atlantic (*n* = 31) | | | | 0 | 0 | 1,000 |
| Southeast (*n* = 45) | | | | 0 | 0 | 5,125 |
| Midwest (*n* = 68) | | | | 0 | 0 | 4,500 |
| Southwest (*n* = 45) | | | | 0 | 0 | 3,750 |
| Mountain Plains (*n* = 58) | | | | 0 | 0 | 300 |
| Western (*n* = 43) | | | | 100.00 | 0 | 1,900 |

0.001, $r = 0.45$ medium effect) or the Western region ($Mdn = 26.00$; $U = 661.00$, $p < 0.001$, $r = 0.41$ medium effect). Hanna (2008) reported districts in the Southeast used significantly fewer convenience items than did districts in the Midwest. Future research should determine if there is a link between use of convenience items and small equipment purchases of food safety items such as color-coded cutting boards, shallow pans, chill sticks, etc. Respondents from the Southeast were compared to respondents from the Midwest and the Mountain Plains region on average number of food safety training hours per site-level manager. Respondents from the Southeast reported significantly more food safety training hours ($Mdn = 12.00$) than did respondents from the Midwest region ($Mdn = 6.00$, $U = 1033.00$, $p = 0.002$, $r = 0.30$ medium effect) or respondents from the Mountain Plains region ($Mdn = 8.00$, $U = 945.50$, $p = 0.004$, $r = 0.28$ small effect). Respondents from the Southeast were compared to those from the Western region with regard to the annual cost paid by their district to obtain health inspections. Respondents from the Western region paid significantly more ($Mdn = \$100$) than did respondents from the Southeast region ($Mdn = \$0$) for their health inspections ($U = 514.00$, $p < 0.001$, $r = 0.49$ medium effect). It is unknown why the Western USDA region pays significantly more for health inspections. This is an area for future research.

*Do respondents differ significantly on identified dependent variables based on their education level?* Respondents were asked to select one of six categories that best described their education level: some high school, high school, some college, associate's degree, bachelor's degree, and graduate degree. Significant differences among categories of education existed for three variables: total large equipment purchases, $H(4) = 30.00$, $p < 0.001$; total small equipment purchases; $H(5) = 96.55$, $p < 0.001$; and number of food safety training hours per site-level manager, $H(5) = 19.05$, $p = 0.002$, as shown in Table 22. Post

hoc testing compared respondents who had a bachelor's degree to those who had a graduate degree regarding these three variables. Because only one post hoc test on each variable was conducted, the alpha level for the comparison was 0.05. For total large equipment purchases, respondents with a graduate degree purchased significantly more large equipment items (*Mdn* = 16.50) than did respondents with a bachelor's degree (*Mdn* = 7.00; *U* = 633.50 *p* = 0.04, *r* =0.22 small effect). For total small equipment purchases, respondents with a graduate degree purchased significantly more small equipment items (*Mdn* = 164.00) than did

Table 22. *Kruskal-Wallis Test on Dependent Variables Based on Respondents' Education Level*

| Dependent variable | *H* | *df* | *p* | *Mdn* | Min | Max |
|---|---|---|---|---|---|---|
| Total large equipment purchases | 30.00 | 4 | <0.001 | | | |
| Some high school (*n* = 0) | | | | | | |
| High school (*n* = 34) | | | | 3.00 | 1 | 23 |
| Some college (*n* =37) | | | | 4.00 | 1 | 10 |
| Associate's degree (*n* = 23) | | | | 4.00 | 1 | 69 |
| Bachelor's degree (*n* = 45) | | | | 7.00 | 1 | 362 |
| Graduate degree (*n* = 38) | | | | 16.50 | 1 | 84 |
| Total small equipment purchases | 96.55 | 5 | <0.001 | | | |
| Some high school (*n* = 1) | | | | 38.00 | 38 | 38 |
| High school (*n* = 73) | | | | 15.00 | 2 | 362 |
| Some college (*n* = 77) | | | | 28.00 | 2 | 1,033 |
| Associate's degree (*n* = 46) | | | | 60.00 | 8 | 1,032 |
| Bachelor's degree (*n* = 98) | | | | 75.00 | 4 | 10,129 |
| Graduate degree (*n* = 59) | | | | 164.00 | 2 | 6,862 |
| Food safety training hours per site-level manager | 19.05 | 5 | 0.002 | | | |
| Some high school (*n* = 1) | | | | 4.00 | 4 | 4 |
| High school (*n* = 67) | | | | 6.00 | 0 | 40 |
| Some college (*n* = 70) | | | | 10.00 | 0 | 55 |
| Associate's degree (*n* = 44) | | | | 12.50 | 0 | 40 |
| Bachelor's degree (*n* = 94) | | | | 10.00 | 0 | 60 |
| Graduate degree (*n* = 59) | | | | 14.00 | 0 | 50 |

respondents with a bachelor's degree (*Mdn* = 75.00; *U* = 2025.50, *p* = 0.002, *r* = 0.25 small effect). However, the difference in food safety training hours between respondents with a graduate degree (*Mdn* = 14.00) and those with a bachelor's degree (*Mdn* = 10.00) was not significant (*U* = 2368.00, *p* = 0.13).

*Do respondents differ significantly on identified dependent variables based on size of school district?* Participants identified student enrollment for academic year 2007–2008. Responses were placed into one of three categories to designate the size of the district: small districts (student enrollment up to 2,499), medium districts (enrollment of 2,500 to 9,999 students), and large districts (more than 10,000 students). Significant differences among groups based on size of district were reported for four variables: total large equipment purchases, total small equipment purchases, number of food safety training hours per site-level foodservice assistant, and number of food safety training hours per site-level manager (Table 23). The hypotheses for post hoc testing were that large school districts would report more total large and small equipment purchases and more food safety training hours per assistant and manager than would medium or small districts. Two comparisons were conducted for each significant dependent variable. Therefore, using a Bonferroni correction of 0.05/2, the alpha level for each comparison was 0.025. For total large equipment purchases, $H(2) = 79.54$, $p < 0.001$, large districts (*Mdn* = 26.50) purchased significantly more large equipment items than did small districts (*Mdn* = 3.00; *U* = 108.50, $p < 0.001$, *r* = 0.74 large effect) or medium districts (*Mdn* = 8.00; *U* = 349.50, $p < 0.001$, *r* = 0.55 large effect). For total small equipment purchases, $H(2) = 145.31$, $p < 0.001$), large districts (*Mdn* = 308.50) purchased significantly more items than did small districts (*Mdn* = 24.00; *U* = 621.00, $p < 0.001$, *r* = 0.65 large effect) or medium districts (*Mdn* = 79.00; *U* = 928.50, *p* <

Table 23. *Kruskal-Wallis Test on Dependent Variables Based on Respondents' Size of School District*

| Dependent variable | *H* | *df* | *p* | *Mdn* | Min | Max |
|---|---|---|---|---|---|---|
| Total large equipment purchases | 79.54 | 2 | <0.001 | | | |
| Small (*n* = 90) | | | | 3.00 | 1 | 24 |
| Medium (*n* = 51) | | | | 8.00 | 1 | 119 |
| Large (*n* = 38) | | | | 26.50 | 6 | 362 |
| Total small equipment purchases | 145.31 | 2 | <0.001 | | | |
| Small (*n* = 196) | | | | 24.00 | 2 | 1,085 |
| Medium (*n* = 101) | | | | 79.00 | 2 | 10,129 |
| Large (*n* = 58) | | | | 308.500 | 19 | 6,862 |
| Food safety training hours per site-level foodservice assistant | 8.30 | 2 | 0.02 | | | |
| Small (*n* = 193) | | | | 6.00 | 0 | 50 |
| Medium (*n* = 105) | | | | 8.50 | 0 | 65 |
| Large (*n* = 59) | | | | 8.00 | 0 | 215 |
| Food safety training hours per site-level manager | 18.39 | 2 | <0.001 | | | |
| Small (*n* = 179) | | | | 8.00 | 0 | 48 |
| Medium (*n* = 101) | | | | 12.00 | 0 | 40 |
| Large (*n* = 59) | | | | 14.00 | 0 | 60 |

0.001, $r = 0.57$ large effect). Although significant differences between large and small districts were reported for food safety training hours for site-level assistants, comparisons exceeded the alpha level of 0.025, which was computed using the Bonferroni correction, and therefore are not reported. For food safety training hours per site-level manager, $H(2) = 18.39$ $p < 0.001$, large districts reported significantly more training hours (*Mdn* = 14.00) than did small districts (*Mdn* = 8.00; $U = 3707.50$, $p = 0.001$, $r = 0.22$ small effect).

*Do respondents differ significantly on identified dependent variables based on their years of school foodservice experience?* Respondents were asked to select one of four categories that best described their years of school foodservice experience: 0–5, 6–15, 16–25,

and 26 plus years. No significant differences were found for large equipment purchases and number of training hours for site-level manager or foodservice assistant based on years of school foodservice experience. Significant differences among groups of years of school foodservice experience were identified for total small equipment purchases, $H(3) = 10.33$, $p = 0.02$ (Table 24). Post hoc testing compared those respondents with 26 plus years of experience to those respondents who had 0–5 years of experience and those respondents who had 16–25 years of experience. The alpha level for each comparison was 0.025, using a Bonferroni correction of 0.05/2. Respondents with 26 plus years of school foodservice experience purchased significantly more small equipment items (*Mdn* = 80.00) than did respondents with 0–5 years of school foodservice experience (*Mdn* = 21.00; $U = 808.00$, $p = 0.003$, $r = 0.30$ medium effect). However, there was no significant difference in the amount of small equipment purchases between respondents with 26 plus years of school foodservice experience (*Mdn* = 80.00) and respondents with 16–25 years of school foodservice experience (*Mdn* = 44.50; $U = 3061.50$, $p = 0.19$).

Table 24. *Kruskal-Wallis Test on Dependent Variables Based on Respondents' Years of Experience*

| Dependent variable | *H* | *df* | *p* | *Mdn* | Min | Max |
|---|---|---|---|---|---|---|
| Total small equipment purchases | 10.33 | 3 | 0.02 | | | |
| 0-5 (*n* = 41) | | | | 21.00 | 4 | 1,086 |
| 6-15 (*n* = 138) | | | | 46.00 | 2 | 6,515 |
| 16-25 (*n* = 114) | | | | 44.50 | 2 | 6,862 |
| 26 plus (*n* = 61) | | | | 80.00 | 4 | 10,129 |

## *Case Study*

### *Demographics*

Two large school districts in the state of Florida participated in Phase 3 of this research study. Districts were identified by the Florida State Department of Education as having successfully implemented a food safety program in compliance with the federal mandate of 2004. Student enrollment for school year 2007–2008 was 67,250 for District 1 and 12,230 for District 2. Median enrollment in the national survey was 2,100 students. District 1 had 44 elementary, 15 middle, and 15 high school cafeterias and operated a central warehouse for food and supplies. District 2 had nine elementary, four middle, and three high school cafeterias. Based on size of school district classification used in the national survey, both District 1 and 2 were classified as large districts. The average school foodservice experience of the district-level foodservice HACCP administrator was 11 years (8 and 14 years, respectively) compared to 16 years found in the national sample. Both HACCP administrators were female and held current CFP through ServSafe®. District 1 required managers to have current CFP; this requirement was in place prior to the 2004 mandate.

### *Equipment Purchases by District*

*Large equipment*. Neither District 1 nor 2 had purchased blast chillers or warming units to comply with the HACCP mandate. This finding is not surprising, as 94% ($n$ = 523) of national survey respondents had not purchased a blast chiller. Almost 45% ($n$ = 239) of national survey respondents had purchased warming units to comply with the new requirement to implement HACCP either prior to or after 2004. District 2 had purchased freezer/cooler alarm systems prior to the 2004 mandate. The freezer/cooler alarm system was not paid for out of the school nutrition program budget as it was considered part of the

district's alarm system and, thus, purchased through the district's general fund. When asked if other large equipment items (greater than $500 expenditure) had been purchased to comply with the new requirement, both districts replied, "No."

*Small equipment.* Both Districts 1 and 2 had purchased thermometers to comply with the new HACCP mandate. District 1 had regularly purchased thermometers before and after 2004, whereas District 2 purchased them only after the 2004 mandate. Both districts had purchased bi-metallic stemmed thermometers. Findings from the national survey showed bi-metallic stemmed thermometers were the type of food temperature measuring device purchased in the greatest quantity. District 2 purchased bi-metallic stemmed thermometers for all units but also provided digital thermometers to site-level managers. District 1 planned to pilot test medium-sized chill sticks during the 2008–2009 school year, whereas District 2 had purchased medium-sized (128 oz.) chill sticks to comply with the new requirement to implement HACCP. The chill stick purchases made by the two case study districts reflects the finding in the national survey that, on average, medium-sized chill sticks were purchased more often than were small or large. Neither district's HACCP administrator stated that district had purchased color-coded cutting boards, however a District 1 site manager identified that two sets of 15" X 20" color-coded boards had been purchased. It is possible that the District 1 HACCP administrator was unaware site-level managers had purchased color-coded cutting boards. Other small equipment purchased by both districts included shallow pans and heat lamps. Shallow pans were identified in the national survey as the small equipment item purchased by districts in the greatest quantity with a median number of 21 purchased by districts. Phase 3 findings are consistent with national survey findings as District 1 and District 2 purchased an average of nine pans per site. In addition, shallow pans

were also the small equipment item purchased in the greatest quantity by the two case districts. District 1 had also purchased ice packs and transport bags for satellite service temperature control of cold food.

*Organizational Inputs*

*HACCP administrator inputs.* HACCP administrators were asked how many hours of food safety/HACCP training they had participated in prior to implementing their district's food safety plan. District 1's HACCP administrator had participated in 40 hours, whereas District 2's had participated in approximately 25 hours. Using the median-based hourly wage identified in the national survey, HACCP administrator training costs for District 1 and 2 were estimated at $720 and $450, respectively (Table 25). Both district's administrators identified State of Florida and SNA as providers of the training. Food safety activities in place and documented in the districts prior to the federal mandate were temperature logs. District 1 had also implemented food safety site self-inspections prior to the mandate.

*Site manager input.* Because both Districts 1 and 2 had purchased bi-metallic stemmed thermometers, site managers were asked the frequency of thermometer calibrations. District 1 Sites A and B site managers indicated that this occurred 1 to 2 times per month, whereas District 2 site managers stated calibration of the bi-metallic stemmed thermometers occurred 1 to 2 times per day or as needed (i.e., when dropped). Site managers of both districts stated records of the calibration process were kept. The District 1 Site B site manager responded in the negative when asked if the thermometer calibration process was documented, but stated, "We are supposed to." Site managers from all four sites in the two districts reported the length of the calibration process was 5 minutes. District 1 and 2 conducted in-house food safety inspections, District 1 monthly and District 2 on a weekly

basis. Site managers reported that the time to conduct these inspections ranged from 30 minutes to 2 hours; the average time computed in the national phase of the study was 1 hour and 45 minutes. Thus, labor cost to conduct inspections was calculated at $21 based on a median hourly wage of $12.00 for site management, as found in the national survey phase of this study. Almanza and Ghiselli (1998) found that time to complete the manager's HACCP Checklist (process comparable to site inspection) averaged approximately 30 minutes with a range between 15 minutes and almost an hour. This study was conducted in grill-type operations, whereas operations in the present study produced an average of almost 1,000 meals per day. Almanza and Ghiselli speculated management experience could have been one reason for the range in the time requirement. Although management experience could be a factor for reported/observed time needed to complete in-house inspections, in this study the experience level of site managers was not asked.

District 1 provided a copy of the site inspection form. Inspection areas included personal hygiene, food storage, equipment, food handling, hot holding, cleaning and sanitizing, garbage disposal, pest control, food recall, washing fruits and vegetables, preventing cross contamination, and transporting. Site managers were asked how monitoring logs are used in their operations. All site managers indicated logs are reviewed daily to verify that the food safety program is working. In District 2 Site B each log is signed after review. Although not required, this notifies administration that the log was reviewed and by whom. Time reported by site-level managers to review monitoring logs ranged from 5 to 20 minutes; the average time computed in the national phase of this study was 12 minutes. Thus, labor cost to review daily monitoring logs was calculated at $2.40 based on a median hourly wage of $12.00 as found in the national survey. Therefore, the annual cost to the district would be

approximately $435 per year (180 days), per site. Types of problems identified during monitoring log review included improper temperatures, corrective action completed but not documented, and unsafe storage temperatures. Managers may be aware of corrective actions taken but not documented. The estimated weekly labor cost for site-level managers to conduct one self-inspection and review daily monitoring logs was $33. (See Table 25.)

Finally, site managers were asked to identify the greatest implementation challenges of the district's HACCP-based food safety plan. Time, getting employees to record temperatures and sanitizer levels, and cooling of leftovers were identified as the greatest challenges. These findings are supported by the NFSMI 2005 study in which site-level

Table 25. *Estimated Food Safety Related Costs per District*

| Item | District 1 | District 2 |
|---|---|---|
| HACCP administrator training costs (based on $18.00 per hour) | $720 | $450 |
| Site-level manager training costs per position[a] | $120 | $120 |
| Self-inspection[b] | $189 | $756 |
| Monitoring log review | $435 | $435 |
| Large equipment purchased to comply with new food safety mandate | $0 | $0 |
| Other small equipment purchased to comply with new food safety mandate (number of thermometers, chill sticks, and color-coded cutting boards not obtained) | Shallow pans (12): $272<br>Ice packs (10): $74<br>Transport bags (5): $140 | Shallow pans (6): $154 |
| Total annual estimated cost per site | $1,950 | $1,915 |

[a]Information obtained from national survey. [b]District 1 monthly; District 2 weekly.

managers identified time and personnel as the greatest challenges to HACCP implementation.

*Perceptions of School District Support*

*HACCP administrator.* HACCP administrators were asked to identify their perceptions of school district support for the food safety program. They were asked to rate support from district's superintendent, BOE, and maintenance personnel using a 5-point Likert-type scale ranging from 1 = *Very unsupportive* to 5 = *Very supportive.* District 1's administrator rated the superintendent as supportive (rating of 4). The administrators from District 2 did not actually rate the supportiveness of the superintendent but responded with a comment: "If superintendent knew about HACCP, I think he would be supportive." This comment reinforces the theme introduced in the national survey phase of this research that administrators are unaware of food safety requirements in schools. The administrators were asked to describe ways in which the district's superintendent demonstrated supportiveness. District 1's administrator stated the superintendent allowed managers to attend a 2-day offsite ServSafe® course and continues to support food safety training of line staff.

District administrators were asked about the supportiveness of the BOE. District 1's administrator rated BOE as supportive (rating of 4). This district's BOE demonstrated support by approving job descriptions that required mandatory food safety training every 3 years for line staff, plus approval of food safety policies. Again, the administrator from District 2 indicated that if the BOE were aware of food safety requirement, they would be supportive. Board-level policies such as requiring the foodservice department to maintain a food safety plan existed in District 1. District 2's administrator did not report any board-level food safety policies. Administrators from both districts reported foodservice department

HACCP-based SOPs (policies) for food safety including breakfast in the classroom, dress code, and transporting of food. When asked about the supportiveness of maintenance personnel toward food safety, administrators from both Districts 1 and 2 rated maintenance personnel as somewhat supportive (rating of 3) but did not respond to the request to describe how maintenance demonstrated their support of the food safety plan. District 1 pays for a portion of maintenance out of the foodservice budget. Other fees assessed by District 1 and paid out of the foodservice budget included a portion of utilities used by CNP, two maintenance positions (one position for the purpose of maintaining heating and air conditioning units, including central warehouse, and freezers and coolers at the site level) and 50% of the salaries for 10 cafeteria monitors for cleanup of the eating area. District 2 was not assessed any fees by the school district for food safety-related services. When asked to rate cost as a barrier to implementing and sustaining the food safety program (using a 5-point Likert-type scale ranging from 1 = *No barrier* to 5 = *Critical barrier*), the HACCP administrator from District 1 rated cost as an important barrier (rating of 4), whereas the HACCP administrator from District 2 rated cost as somewhat of a barrier (rating of 2).

District HACCP administrators were asked if there was anything else they would like to share regarding HACCP or food safety. District 1's administrator identified inconsistencies in federal and state food code recommendations, like the temperature danger zone. The state of Florida currently utilizes the 1999 *FDA Food Code*, which does specify a different temperature danger zone than the current code. However, the temperatures in the 2005 *FDA Food Code* are minimum requirements; therefore achieving a higher temperature is exceeding the minimum standard. Further, District 1's administrator was concerned that schools are receiving health inspections based on the knowledge of the inspector and that

inspectors in the county had differing opinions on the interpretation of the state code. District 2's administrator stated more time was needed by site-level staff to conduct food safety related duties.

*Site manager.* Site managers were asked if the district's investments in a HACCP-based food safety plan had resulted in safer food served to children in the district and nationally. All four site managers stated, "Yes" to both questions. Reasons given were that employees are more aware of food safety and that the documentation required provides proof that the system is working as intended. Over 50% ($n$ = 309) of respondents in the national survey thought HACCP had resulted in safer food served to children in their districts. In addition, over 50% ($n$ = 294) of respondents thought HACCP had resulted in safer food served to children nationally. When asked, "Why is it safer?" 97 respondents stated staff was more aware of need for food safety practices. Both Phase 2 (the national survey) and Phase 3 (case study districts) findings in this study support the concept that school food administrators perceive increased employee awareness of food safety will result in safer food being served to children.

# CHAPTER 5. SUMMARY AND CONCLUSIONS

In this three-phase exploratory study, inputs required and/or desired to implement and sustain a food safety plan based on HACCP principles were explored. Phase 1 consisted of a national expert panel of 12 school foodservice directors who provided information regarding HACCP implementation costs and inputs. In Phase 2, an online survey, developed from the results from an expert panel, was electronically sent to a stratified, random national sample of public school foodservice administrators. Multiple choice, rating, yes/no, and open-ended questions included the following categories: large and small equipment purchases by districts; facility renovations and upgrades; organizational inputs such as training, writing SOPs, and obtaining the required number of health inspections; and perceptions of respondents about HACCP implementation and effectiveness. Demographic questions included student enrollment, number of sites that prepare or prepare and serve food, USDA region, and date of upcoming CRE. Questions related to the survey responder included job title, food safety certification and other credentials, education level, area of study in education program, number of years in school foodservice, management type of foodservice program, and gender. Groups used in the analyses were designated by USDA region, education level, years of school foodservice experience, year of CRE, and district size classification. Phase 3 consisted of site observations in two large school districts in the state of Florida. Two sites (elementary and secondary) in each district were observed, and the district-level HACCP administrator and site manager were interviewed. A summary of the findings, study limitations, conclusions, and recommendations for future research are presented in this chapter.

*Summary of Findings*

This study consisted of seven research questions. Research question 1 sought to identify estimated inputs (equipment purchases, labor, and training) incurred by public school districts to meet requirements of their districts' food safety plan. Based on responses from 567 school foodservice administrators, large and small equipment purchases were identified; the number of labor hours to develop original SOPs were computed; costs to provide training, as well as labor costs for participants, were calculated; and finally additional staff hired due to new requirements was determined. Data regarding specific large equipment purchases (blast chillers, freezer/cooler alarm systems, and warming units) identified by the expert panel were presented. Over 90% ($n$ = 523) of responding districts had not purchased blast chillers, however almost 45% ($n$ = 239) had purchased warming units, and only 22% ($n$ = 111) of these respondents had purchased freezer/cooler alarm systems. Respondents were presented with a list of other large equipment purchased to comply with HACCP. Almost 70% ($n$ = 317) of the respondents to this question said they had not purchased any of these items. Of the large equipment items presented, refrigerated storage and hot holding equipment was identified by approximately 15% ($n$ = 69) of respondents. This study found that the majority of school districts had not purchased blast chillers ($n$ = 523), freezer/cooler alarm systems ($n$ = 390), nor warming units ($n$ = 300); however, approximately 60% of respondents stated if cost were no object, they would buy blast chillers and warming units ($n$ = 261, $n$ = 267, respectively), and 70% ($n$ = 317) indicated they would purchase freezer/cooler alarm systems. Findings suggest there may be perceptions that blast chillers, warming units, and freezer/cooler alarm systems are required for a HACCP-based food safety plan, however specification of equipment is not included in

the USDA Guidance document nor is there extensive research concluding these components are necessary. Per site, a school district would spend an estimated average of $25,500 to purchase one blast chiller, one pass-thru warming unit, and one freezer cooler alarm system.

Specific small equipment items (thermometers, chill sticks, and color-coded cutting boards) identified by the expert panel were presented. The majority ($n$ = 413) of school districts responding to the national survey had purchased thermometers. Although bi-metallic stemmed thermometers were purchased in the highest quantity ($Mdn$ = 12 per district), 60% ($n$ =181) of those purchasing thermometers had purchased digital probe thermometers. Only 33% ($n$ = 147) of respondents had purchased color-coded cutting board, and even fewer (22.6%; $n$ = 103) indicated purchasing chill sticks. Respondents were presented with a list of other small equipment items that may have been purchased by their districts to comply with HACCP. Shallow pans (2" deep) were identified by almost 60% ($n$ = 129) of respondents as the item purchased in the greatest quantity, with a median of 21 pans per district and a range from 2 to 432 pans. Per site, a school district would spend an estimated average of $105 to purchase 12 bi-metallic stemmed thermometers, $525 to purchase 21 pans, and $515 to purchase 10 chill sticks.

To reduce likelihood of results being affected by economies of scale, total large and small equipment purchases were examined in relation to the number of sites reported by small, medium, and large districts. Large districts did purchase more large equipment than did small and medium-sized districts per site. Large districts also purchased more small equipment items than did small districts, however purchases of small equipment items by large districts were similar to those made by medium-sized districts.

Respondents were asked the estimated total costs or fees of providing food safety training during school year 2005–2006. Respondents ($n$ = 295) reported the median cost or fee for training of both managers and foodservice assistants was $500 with a minimum per district of $75 and a maximum of $50,000. Further, labor costs for training of site-level managers and workers were calculated at $1,365 for these trainings based on median hourly wages ($12.00 and $9.00, respectively) multiplied by the number of training hours per manager (4) and assistant (8).

Finally, respondents were surveyed to see if more staff were hired as a result of the new requirement to implement HACCP. Most respondents (95.4%; $n$ = 392) indicated district foodservices had not hired more staff. Of the 5% ($n$ = 24) who had hired additional staff, 16 were site-level and 8 were district-level positions. The median annual salary for district-level personnel was $16,320, ranging from $8,000 to $56,000, and the median hourly wage for the site-level foodservice assistants was $8.65, ranging from $7.00 to $20.00.

Research question 2 determined if there was an increase in food safety/HACCP training as a result of the new requirement to implement a food safety plan based on HACCP principles. For all three school years in question (years ending 2005, 2006, and 2007), 446 districts reported that managers had received more food safety training during those years than in prior years, with 57.2%, 76.2% and 80.7% responding affirmatively for each of the respective years. Foodservice assistants received more food safety training during school year(s) ending 2005, 2006, and 2007 than in prior years.

Research question 3 identified what organization provided food safety and/or HACCP training. Sixty-six percent ($n$ = 267) of respondents reported the district's foodservice staff conducted the food safety training course(s). Other frequent providers of food safety training

were: state or local level health department ($n$ = 171), state department of education ($n$ = 162), and the SNA ($n$ = 142).

Research question 4 determined the estimated costs associated with developing and implementing districts' original food safety SOPs. Respondents were asked to identify members of the HACCP team who were primarily responsible for writing the district's original HACCP-based SOPs. Approximately three fourths (76.4%, $n$ = 305) of the 399 respondents to this question reported the district's foodservice director was primarily responsible for writing the procedures. Only 30% ($n$ = 120) of respondents indicated site-level managers were mostly responsible for writing the procedures. Respondents indicated a median of 40 labor hours, with a range of 4 to 2,000 hours, was spent writing these procedures. The median of 40 hours per district was multiplied by the median hourly wage of $18.00 per hour for an estimated labor cost of $720 per HACCP team member; therefore, the greater number of members, the greater the cost.

Research question 5 determined what costs were associated with meeting the requirement for two food safety inspections from an approved entity. Most respondents (81.4%, $n$ = 413) replied there had not been any additional costs associated with obtaining the required number of annual health inspections. Further, the annual cost paid by districts to obtain the two required health inspections for each site ranged from $25 to $5,125. The Western USDA region was found to pay significantly higher fees for health inspections. The reason(s) for this finding are unknown.

Research question 6 determined if there was a difference in estimated costs to implement a HACCP-based food safety plan based on year of CRE, USDA region, educational level, size of school district, and years of school foodservice experience. Groups

were compared regarding the following computed variables: large and small equipment purchases, number of food safety training hours for managers and assistants, and cost of health inspection. No significant differences were found based on year of CRE. Significant differences for small equipment purchases were identified based on USDA region, specifically between Southeast and Midwest, and Southeast and Western regions. Respondents from the Southeast region purchased significantly more small equipment than did respondents from the Midwest and Western regions. Significant differences for number of training hours for managers were identified based on USDA region, specifically between Southeast and Midwest, and Southeast and Mountain Plains. Respondents from the Southeast region reported significantly more food safety training hours than did those from the Midwest or Mountain Plains regions. In addition, Western region districts paid significantly more for health inspections than did those from the Southeast. Education levels compared respondents with bachelor's degree with those holding graduate degrees. For total large and small equipment purchases, those with a graduate degree purchased significantly more than did those with a bachelor's degree. Further, there were no significant differences for number of food safety training hours per site-level manager. Significant differences existed among size of school district: large, medium, and small. Large districts purchased significantly more large and small equipment than did medium or small districts. In addition, large school districts reported significantly more food safety training hour for site-level managers than did small districts. Finally, significant differences among groups of years of school foodservice experience were identified for total small equipment purchases only. Respondents with 26 plus years of school foodservice experience purchased significantly more small equipment items than did respondents with 0–5 years of school foodservice experience. However, there

was no significant difference in the amount of small equipment purchases between respondents with 26 plus years of school foodservice experience and those with 16–25 years of school foodservice experience.

Finally, this study sought to identify overall challenges perceived by public school foodservice administrators regarding implementation of the district's HACCP-based food safety plan. The number one challenge, among those identified by 292 respondents, was time ($n$ = 85), followed by paperwork ($n$ = 47), training ($n$ = 38), and money ($n$ = 37). Although money was listed fourth, lack of funds in the foodservice department budget was identified by respondents as the number one reason why large ($n$ = 87) and small ($n$ = 103) equipment purchases had not been made.

### *Limitations of the Study*

Several limitations of this study are recognized. Self-reported data rely on respondents to provide accurate information. This study asked school foodservice administrators to recall financial information, such as equipment purchased, expenses, and number of training hours, from previous school years. Administrators may not have remembered such detailed information or not had information readily available at the time of survey completion, therefore this study provides cost and input estimates only. In addition, administrators may not have worked for the district during the timeframe presented in some questions and, thus, provided information that may be less accurate or based on previous job experience(s). Although almost 70% ($n$ = 278) of respondents indicated their title as foodservice director, other respondents indicated job titles, such as superintendent ($n$ = 9), which may indicate being less familiar with food safety requirements of CNPs,

Data collection using electronic surveys presents another limitation. District or company firewalls may have prevented e-mails from getting to the school foodservice administrator. It is also easy for administrators to delete e-mails or postpone completion until a later date, and thus forget it. Web-based survey formatting is confined to the company provider of the Web survey. For example, each inquiry must be a separate question. These findings did not surface during pilot-testing. Survey length and detail may have been limitations, although electronic survey questions could be skipped if not applicable. Further, questions related to large equipment purchases required respondents to identify equipment purchased based on a written description. Respondents may not have understood the description, thus causing an incorrect item to be selected. Finally, variations in state regulations, such as versions of the food code, types of inspections conducted, approved training providers, and requirements for food safety training may have impacted the findings.

*Conclusions*

The Child Nutrition and WIC Reauthorization Act of 2004 required school nutrition programs to implement a school food safety program based on HACCP principles for each meal preparation and service site in their district no later than July 2006. CNPs are expected to be nonprofit and operate at a break-even level (USDA, 2003{USDA/ERS 2008a, 2008b, USDA/FNA 2008a, 2008b}). Although no additional federal funding was appropriated to compensate districts for costs associated with the new food safety mandate, CNPs have had to absorb these costs and may have labeled them as the costs associated with doing business. The Regulatory Impact Analysis estimates the total cost associated with implementing a HACCP-based food safety program at $42.5 million in the first year (School Food Safety Program, 2008). Researchers have calculated the cost per child at $1.50 by dividing $42.5

million by an estimated 28 million program participants (USDA/ERS, 2008). By this calculation, a medium-sized district as defined in this study (2,500 to 9,999 students) was estimated to have spent between $3,750 and $15,000. FNS expects annual costs to decline, with 5-year costs totaling $99.3 million. Based on findings from the present study, CNPs did incur initial costs for equipment, training, and labor to develop original SOPs. Further, costs to sustain and/or improve the food safety program were identified, specifically costs associated with annual small equipment purchases (thermometers, etc.) and future facility renovations and upgrades. Study findings have several implications for practitioners. Those in charge of school meal programs should be sure that there is training on proper use of bi-metallic stemmed thermometers and need for proper calibration of this widely used food temperature measuring device; maintaining food and equipment temperature monitoring equipment; and work simplification techniques to reduce time associated with monitoring and documenting the plan.

Research has shown that there is an increase in use of convenience foods (Hanna, 2008). Changes in school foodservice operations such as increased use of convenience foods or food safety equipment purchases should be reflected with modifications to the district's HACCP plan. Further, buying locally grown produce (farm to school initiatives) or increased scratch production in an effort to provide healthier food options may impact the district's food safety plan. Thus, SOPs should be reviewed each time there is a change in menu items, procurement form, or recipe procedures. In addition, barriers to HACCP were identified. The top five challenges to HACCP were time ($n$ = 85), paperwork ($n$ = 47), training ($n$ = 38), money ($n$ = 37), and staff buy-in/changing behaviors ($n$ = 33). However, a perception of a benefit of implementing a HACCP-based food safety program is the reduced risk of

foodborne illnesses in school meals (School Food Safety Program, 2008). To date, USDA has not issued review guidance to state agencies, however proposed rules released on August 5, 2008, recommended a HACCP program review continue to be a part of SMI or CRE (School Food Safety Program, 2008). There is a need to provide state agencies with consistent guidance and training on how to evaluate a district's HACCP-based food safety plan. Additional guidance could lead to future costs incurred by districts if need for changes are identified.

### *Recommendations for Future Research*

This study obtained data on large and small equipment purchased as a result of implementing and sustaining a food safety plan based on HACCP principles. Future research should address perceptions of equipment efficiency, durability, use, and cost benefit. Research is needed to identify what SOPs were added after the original plan was implemented as well as the time associated with maintaining the plan. This study found that in hindsight, approximately 30% ($n$ = 254) of respondents would have hired a consultant to write the plan. Future research should determine if there has been an increase in the use of HACCP consultants. In addition, the stage of HACCP implementation should be determined. For example, have school districts fully integrated food safety into the culture at each site, including annual training, corrective actions, verification, and has the plan been updated to reflect necessary changes? Most respondents indicated they had not purchased blast chillers ($n$ = 523), or chill sticks ($n$ = 353). Future research should identify how districts are monitoring the final stage of two-stage cooling.

A continuous theme of lack of administrative support or knowledge of food safety/HACCP requirements was identified. Future research should explore school district

administrator support for child nutrition programs as well as school nutrition administrators' perceived support from the BOE, superintendent, and other district-level program administrators, such as maintenance. Finally, research should include tracking of foodborne illness outbreaks in CNPs, including number of persons infected, pathogen identification, source of contamination, and if litigation was pursued.

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# APPENDIX A. HUMAN SUBJECTS APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office of Research Assurances
Vice Provost for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

**DATE:** 17 January 2007

**TO:** Cyndie Story
1422 Ingleside Avenue, Jacksonville, FL 32205

**FROM:** Jan Canny, IRB Administrator
Office of Research Assurances

**SUBJECT:** IRB ID 06-637

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The Chair of the Institutional Review Board has reviewed the project "Cost of implementing and sustaining a school food safety program" and determined that the project does not meet the definition of human subject research according to the federal guidelines, 45 CFR 46.

This research includes an "establishment survey," to assess the costs of implementing and sustaining school food safety programs. The current survey does not include "human subjects" items. Further review will not be required until the next phase of the project.

Because this project does not need IRB approval, you can proceed with the project. We do, however, urge you to protect the rights of your participants in the same ways that you would if IRB approval were required. This includes providing relevant information about the project to the participants. Best practices would include in the e-mail recruitment message a statement of the voluntary nature of participation. However, this is up to your discretion.

Any modification of this project should be communicated to the IRB to determine if the project still meets the definition of not being research. If it is determined that approval is needed, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office of Research Assurances
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

**DATE:** March 12, 2008

**TO:** Cyndie Story
1422 Ingleside Ave., Jacksonville, FL 32205

**CC:** Catherine Strohbehn
11A MacKay Hall

**FROM:** Jan Canny, IRB Administrator
Office of Research Assurances

**TITLE:** **Cost of implementing and sustaining a school food safety program**

**IRB ID:** **06-637** **Study Review Date:** 11 March 2008

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The Institutional Review Board (IRB) Chair has reviewed the modification of this project and has declared the study remains exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as proposed in the IRB application**, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or if required by the IRB.
- **Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making <u>any</u> changes**, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to **use the documents with the IRB approval stamp** in your research.

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

## APPENDIX B. EXPERT PANEL QUESTIONNAIRE

# Cost of Implementing Food Safety Programs in Schools

Thank you for helping us identify costs associated with implementing and sustaining a school food safety program based on HACCP principles as required by federal law. This questionnaire is divided into two sections. In Section I, questions are left open ended for you to describe costs incurred in your district based on the new requirement. You may add additional lines to the tables found in questions 1, 2, 3, and 4. In Section II, questions seek to collect demographic and descriptive information regarding your school district.

## Section I: Food Safety Program Implementation and Costs

1. What **district-level** equipment and supplies have you purchased to comply with the new requirement to implement a food safety program? (Examples: thermometers (describe), refrigerated trucks, hot-holding carts, etc.)

| Item Description | Number Purchased | Unit Cost | Total Cost | Installation Cost |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

2. What **site-level** equipment and supplies have you purchased to comply with the new requirement to implement a food safety program? (Examples: thermometers (describe), blast chillers, chill sticks, storage temperature monitoring, etc.)

| Item Description | Number Purchased | Unit Cost | Total Cost | Installation Cost |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

3. What training have you or your **district-level** foodservice employees participated in, since July 2004, to comply with the new requirement to implement a food safety program?

| Describe Training | Number of hours | Cost | What organization provided the training? |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

4. What training have your **site-level** employees participated in, since July 2004, to comply with the new requirement to implement a food safety program?

| Describe Training | Number of hours | Cost | What organization provided the training? |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

5. Who was responsible for writing your district's school nutrition program's food safety standard operating procedures (SOP)?_____(may be more than one)
   Average hourly wage?_____
   Approximately, how many hours per person were spent writing SOPs?_____

6. What is the estimated, annual percent of work time you spent on HACCP implementation during school year(s) 2004-2005; 2005-2006; 2006-2007?

7. Did your district utilize the help of a consultant in developing your school food safety program?
   Yes_____ No_____ Not Allowed by State_____
   If Yes, please describe the scope of services provided by the consultant, number of hours worked, and the total cost for the consultant.

8. What percent of your total budget is currently allocated to costs related to food safety?_____

9. What percent of your total budget was allocated to costs related to food safety prior to the 2004 Child Nutrition and Reauthorization Act?_____

10. Were any fees assessed by outside organizations to provide the two required food safety inspections per school year? Yes_____ No_____
    If yes, how much per site inspection?_____

11. Did any of your schools receive more than two inspections during school year 2005-2006 or 2006-2007?
    Yes ____ No____
    Why? ___Required by state
    ___Needed for follow up to areas of noncompliance found in first or second inspection
    ___Needed for additional oversight
    ___Other; Please describe:_____

12. Please describe any **district-level** staffing changes made as a direct result of the mandated school food safety program (i.e. new hires, additional hours, increases in pay for duties related to food safety)?

13. Please describe any **site-level** staffing changes made as a direct result of the mandated school food safety program (i.e. new hires, additional hours, increases in pay for duties related to food safety)?

14. If applicable, please describe other costs not previously identified that were incurred while developing, implementing, or maintaining your food safety plan as a result of the new requirement (i.e. software, training videos if not previously listed in equipment or training).

## Section Two: Demographic Information

1. Please state the total number of students enrolled in your school district._____

2. Please indicate the type and number of foodservice operations that are used in your district? (check all that apply)
    ___Onsite kitchens
    Number:_____
    ___Centralized kitchen serving both offsite/onsite
    Number:_____
    ___Central kitchen with no onsite service
    Number:_____
    ___Receiving kitchens
    Number:_____

3. Do you have a centralized warehousing operation? Yes___ No___

4. What year is your next scheduled Coordinated Review Effort (CRE)?_____

5. How many **district-level** foodservice employees work in your child nutrition program?_____

6. How many **district-level** employees hold a current, national certification in food safety (i.e. ServSafe, National Registry of Food Safety Professionals, or Thompson Prometrics, formerly Experior)? _____

7. How many full-time equivalent (FTEs) (site-level) work in your child nutrition program?_____

8. How many **site-level** employees hold a current, national certification in food safety (i.e. ServSafe, National Registry of Food Safety Professionals, or Thompson Prometrics, formerly Experior)? _____ FTEs_____

9. Please list all **district-level** supervisor positions, and the number of sites that position is responsible for supervising. Not applicable_____

10. Please choose one of the following to describe the type of management of the school district's foodservice program
    ___Self-operated
    ___Contract managed

Please complete the questionnaire and return via email to:
Cyndie Story
chefcyndie@bellsouth.net
no later than
**JUNE 8, 2007**

## APPENDIX C. COVER LETTER FOR EXPERT PANEL

May 21, 2007

Dear School Foodservice Director:

Thank you for agreeing to participate as a member of our expert panel. This research study is aimed at identifying costs associated with implementing and sustaining your food safety plan based on HACCP principles. As you are aware, this federal mandate was unfunded; therefore all costs will be paid by your school district.

As a member of our expert panel, you may receive up to two rounds of questionnaires regarding school food safety programs. Responses will be compiled, and if necessary, a second questionnaire will be emailed to you on or about July 20, 2007. Based on results of the surveys with our expert panel, a survey instrument will be developed and mailed to a sample of school foodservice operators.

We request that you complete the attached questionnaire and return via email to chefcyndie@bellsouth.net no later than June 8, 2007.

If you have questions regarding this research study, please contact Cyndie Story by phone at 904-387-6839 or e-mail at chefcyndie@bellsouth.net or Dr. Jeannie Sneed by phone at 515-294-8474 or e-mail at jsneed@iastate.edu.

If you have any questions about the rights of research subjects or research-related injury, please contact the Office of Research Assurances, 1138 Pearson Hall, Iowa State University, 515-294-3315; dament@iastate.edu.

In advance of your participation, we would like to extend a big thank you for your time and effort in this valuable research study.

Sincerely,

Cyndie Story

Cyndie Story, PhD Student
Iowa State University

Jeannie Sneed

Dr. Jeannie Sneed, Professor
Iowa State University

# APPENDIX D. SURVEY INSTRUMENT

## National Cost Survey

### 1. Section I: Large Equipment--What did you purchase?

Directions: In this section, you will be asked questions related to the purchase of large equipment(greater than $500 expenditures) to comply with the new requirement to implement a food safety plan based on HACCP principles.

**1. Were blast chillers purchased to comply with the new requirement to implement HACCP?**

- ◯ YES, purchased prior to requirement
- ◯ YES, purchased after requirement
- ◯ NO

### 2.

Please select the type of blast chiller and how many were purchased. If you don't see the type you purchased, you may write in manufacturer's make and model in question 16.

**2. Reach in, 0--50 lb chilling capacity, with probe**

**How many of this type were purchased?**
**(Zero is an acceptable answer.)**

**3. What company manufactured this product?**

- ☐ Alto Shaam
- ☐ Beverage Air
- ☐ Crescor
- ☐ Delfield
- ☐ Electrolux
- ☐ Traulsen (Hobart)

**4. Reach in, 51-99 lb chilling capacity, with probe.**

**How many of this type were purchased?**
**(Zero is an acceptable answer.)**

**5. What company manufactured this product?**

- ☐ Alto Shamm
- ☐ Beverage Air
- ☐ Crescor
- ☐ Electrolux

## National Cost Survey

**6. Reach in, 100-120 lb chilling capacity, with probe**

**How many of this type were purchased?**
**(Zero is an acceptable answer.)**

**7. What company manufactured this product?**

- [ ] Beverage Air
- [ ] Crescor
- [ ] Electrolux
- [ ] Traulsen (Hobart)

**8. Reach in, 121-160 lb chilling capacity, with probe**

**How many of this type were purchased?**
**(Zero is an acceptable answer.)**

**9. What company manufactured this product?**

- [ ] Alto Shaam
- [ ] Delfield
- [ ] Electrolux

**10. Reach in, 161-250 lb chilling capacity, with probe**

**How many of this type were purchased?**
**(Zero is an acceptable answer.)**

**11. What company manufactured this product?**

- [ ] Delfield
- [ ] Electrolux

**12. Roll-in or Roll-thru, 100-200 lb chilling capacity, with probe**

**How many of this type were purchased?**
**(Zero is an acceptable answer.)**

# National Cost Survey

**13. What company manufactured this product?**

- [ ] Alto Shaam
- [ ] Traulsen (Hobart)

**14. Roll-in or Roll-thru, 201-450 lb chilling capacity, with probe**

**How many of this type were purchased?**
**(Zero is an acceptable answer.)**

**15. What company manufactured this product?**

- [ ] Alto Shaam
- [ ] Delfield
- [ ] Electrolux
- [ ] Traulsen (Hobart)

**16. If the above blast chiller descriptions DO NOT represent your purchase, please write in the:**

Manufacturer's name(s):

Model Number(s):

**17. Referring to question 16, did you purchase a: (check all that apply)**

- ◯ Reach in
- ◯ Roll in or roll thru
- ◯ Walk in

**18. Do the blast chiller(s) in question 16 print a label noting times and temperatures?**

- ◯ YES
- ◯ NO

**3.**

**19. Were warming units purchased to comply with the new requirement to implement HACCP?**

- ◯ YES, purchased prior to requirement
- ◯ YES, purchased after requirement
- ◯ NO

**4.**

## National Cost Survey

What type of warming unit and how many were purchased? Zero is an acceptable answer.

**20. UNHEATED, insulated, STURDY PLASTIC, single compartment, on casters**
**How many of this type were purchased?**

**21. UNHEATED, insulated, STURDY PLASTIC, double compartment, on casters**
**How many of this type were purchased?**

**22. Heated, holding, INSULATED, full size (approximately 70" tall), ALUMINUM exterior MOBILE cabinet.**

**How many of this type were purchased?**

**23. Heated, holding, NON-INSULATED, full size (approximately 70" tall) ALUMINUM exterior, MOBILE cabinet.**

**How many of this type were purchased?**

**24. Heated, holding, INSULATED, full size (approximately 70" tall), STAINLESS STEEL exterior, MOBILE cabinet.**

**How many of this type were purchased?**

**25. Heated, holding, INSULATED, full size (approximately 75" tall, door width 21 inches), STAINLESS STEEL exterior, FIXED LOCATION, Reach-in or Pass-thru**

**How many of this type were purchased?**

**26. Other(s)**
**(Write in manufacturer(s) and model number(s))**
**How many of this type were purchased?**

**5.**

## National Cost Survey

**27. Were freezer/cooler alarm systems purchased to comply with the new requirement to implement HACCP?**

- ◯ YES, purchased prior to requirement
- ◯ YES, purchased after requirement
- ◯ NO

**6.**

**28. Please provide details on the purchased alarm system:**

BRAND OR SYSTEM NAME: _____

NUMBER OF UNITS _____

ESTIMATED COST PER UNIT INSTALLED: _____

**7.**

**29. If cost were no object, how many of the following items would you purchase for your district to achieve the goals of your HACCP-based food safety plan? (Zero is an acceptable answer.)**

Blast Chillers _____

Warmers _____

Freezer/cooler alarm system _____

**8.**

**30. What other LARGE EQUIPMENT items (greater than $500 expenditure) were purchased to meet the needs of your HACCP-based food safety plan? (Check all that apply.)**

- ☐ None
- ☐ Refrigerated truck
- ☐ Single tank dishmachine
- ☐ Multiple tank dishmachine
- ☐ Pot & pan utensil washer
- ☐ Milk coolers
- ☐ Hot holding equipment for serving (example: hot well units)
- ☐ Cold holding equipment for serving (examples: cold well units, milk coolers, refrigerated display units)
- ☐ Refrigerated storage (reach in coolers and freezers)
- ☐ Other (please specify)

_____

## National Cost Survey

**31. Are there any large equipment items that you have identified as needed in your district's HACCP-based food safety plan, but have not yet purchased?**

- ◯ YES
- ◯ NO

**9.**

**32. Why have these purchases not yet been made? (Check all that apply.)**

- ☐ Lack of funds in the Foodservice Department budget
- ☐ Lack of funds in the district's General Fund budget
- ☐ Time to investigate options and make a purchase
- ☐ Lack of electricity
- ☐ Administrative approval is needed
- ☐ Administrators are not aware of need
- ☐ Other (please specify)

**10.**

**33. If future renovations are planned for foodservice sites in your district, what large equipment items (greater than $500) would you budget for to improve your HACCP program? (Check all that apply.)**

- ☐ No renovations planned
- ☐ Air conditioner for dry storage
- ☐ Pass-through refrigerators
- ☐ Pass-through warmers or hot holding
- ☐ Refrigerated display cases
- ☐ Refrigerated milk coolers
- ☐ Hot display cases
- ☐ Dishmachine
- ☐ Hand sinks
- ☐ Storage areas
- ☐ Other (please specify)

# National Cost Survey

**34. If future renovations are planned for foodservice sites in your district, what infrastructure upgrade or repairs need to be budgeted to improve your HACCP program?**

- [ ] No renovations planned
- [ ] Cracks in foundation
- [ ] Plumbing upgrades
- [ ] Cracks in walls
- [ ] Replace ceiling tiles
- [ ] Replace floor tiles
- [ ] Electrical upgrades
- [ ] Ventilation upgrade
- [ ] Lighting upgrades
- [ ] Other (please specify)

## 11. Section II: Small Equipment-What did you purchase?

Directions: In this section, you will be asked questions related to the purchase of small equipment items (less than $500 expenditures) to comply with the new requirement to implement a food safety plan based on HACCP principles.

**35. Were thermometers purchased to comply with the new requirement to implement HACCP?**

- ◯ YES, purchased prior to requirement
- ◯ YES, purchased after requirement
- ◯ NO

## 12.

# National Cost Survey

**36. How many of each type of thermometer are purchased each year to comply with requirements of your district's HACCP-based food safety plan?**

| | |
|---|---|
| Bi-metallic stemmed | |
| Refrigerator | |
| Freezer | |
| Oven | |
| Warmer/pass through | |
| Sensor strips (T-stick) | |
| Digital probe | |
| Digital-dishmachine safe | |
| Thermocouple | |
| Thermocouple with infrared | |
| Infrared thermometer | |
| Thermocouple with HACCP logging system (able to produce reports upon downloading) | |
| Other, please specify | |

**13.**

**37. Were chill sticks purchased to comply with the new requirement to implement HACCP?**

- ◯ YES, purchased prior to requirement
- ◯ YES, purchased after requirement
- ◯ NO

**14.**

**38. How many chill sticks of each size were purchased?**

| | |
|---|---|
| Small (64 oz) | |
| Medium (128 oz) | |
| Large (265 oz) | |

**15.**

**39. Were color-coded cutting board sets purchased to comply with the new requirement to implement HACCP?**

- ◯ YES, purchased prior to requirement
- ◯ YES, purchased after requirement
- ◯ NO

**16.**

## National Cost Survey

**40. How many color coded cutting board sets of each size were purchased?**

12" x 18" _____

15" x 20" _____

18" x 24" _____

**17.**

**41. Were any of the following small equipment items (less than $500 expenditure) purchased to comply with the new requirement to implement HACCP?**

**Color-coded knives**
**Color-coded cleaning & sanitizing buckets**
**Ice transfer containers/buckets**
**Electronic, touchless paper towel dispenser**
**Ice packs**
**Shallow pans (2" deep)**
**Optic sensor faucets for handsink**
**Hands-free foot pedals for handsink**
**Digitizer hand soap dispensers (timer/counter mechanism)**
**Nail brushes**
**Hot food merchandisers (tabletop)**
**Soup kettles**
**Food warmers (heat lamps)**

◯ YES, purchased prior to requirement

◯ YES, purchased after requirement

◯ NO

**18.**

# National Cost Survey

**42. If any of the following small equipment (less than $500 expenditure) items were purchased to comply with the new requirement, please indicate how many of each were purchased.**

| | |
|---|---|
| Color-coded knives | |
| Color-coded cleaning & sanitizing buckets | |
| Ice transfer containers/buckets | |
| Electronic, touchless paper towel dispenser | |
| Ice packs | |
| Shallow pans (2" deep) | |
| Optic sensor faucets for handsink | |
| Hands-free foot pedals for handsink | |
| Digitizer hand soap dispensers (timer/counter mechanism) | |
| Nail brushes | |
| Hot food merchandisers (tabletop) | |
| Soup kettles | |
| Food warmers (heat lamps) | |
| Other, please specify | |

**19.**

**43. What were the estimated office supply costs to comply with the new requirement to implement HACCP (examples: clip boards, printing, notebooks, etc.)?**

**44. Are there any small equipment (less than $500 expenditure) items identified as needed in your district's HACCP-based food safety plan, but have not yet been purchased?**

- ◯ YES
- ◯ NO

**20.**

# National Cost Survey

**45. Why have these purchases not yet been made? (Check all that apply.)**

- [ ] Lack of funds in the Foodservice Department budget
- [ ] Lack of funds in the district's General Fund budget
- [ ] Time to investigate options and make a purchase
- [ ] Lack of electricity
- [ ] Administrative approval is needed
- [ ] Administrators are not aware of need
- [ ] Other (please specify)

## 21. Section III: Training-What did you teach?

Directions: Please respond to the following questions about food safety and HACCP training provided to your school district's foodservice staff.

**46. In your district, did your site-level foodservice assistants (workers) receive more food safety training during the following school years than in years prior to SY 2004-2005?**

| | YES | NO |
|---|---|---|
| SY 2004-2005 | ○ | ○ |
| SY 2005-2006 | ○ | ○ |
| SY 2006-2007 | ○ | ○ |

**47. In your district, did your site-level foodservice managers receive more food safety training during the following school years than in years prior to SY 2004-2005?**

| | YES | NO |
|---|---|---|
| SY 2004-2005 | ○ | ○ |
| SY 2005-2006 | ○ | ○ |
| SY 2006-2007 | ○ | ○ |

**48. Do your site-level foodservice managers hold a current food safety certificate approved by the Conference on Food Protection, i.e., ServSafe®, National Registry of Food Safety Professionals, or Prometric™ (previously known as Experior)?**

- ○ YES
- ○ NO

## 22.

## National Cost Survey

**49. Did your site-level foodservice managers receive a food safety certificate approved by the Conference on Food Protection, i.e., ServSafe®, National Registry of Food Safety Professionals, or Prometric™ (previously known as Experior) as a result of the new requirement to implement HACCP?**

- ◯ YES
- ◯ NO

**50. If the HACCP requirement was not the reason for food safety manager certification, what was?**

- ◯ Required by State
- ◯ Required by school district
- ◯ Other (please specify)

**23.**

**51. How many site level foodservice assistants (workers) did you train during SY 2005--2006?**

**52. What was the average hourly wage of a site level foodservice assistant (worker) during SY 2005--2006?**

**53. What was the average number of food safety training hours (group or individual) per site level foodservice assistant (worker) during SY 2005--2006?**

**54. How many full-time foodservice managers did you train during SY 2005--2006?**

**55. What was the average hourly wage of your full-time foodservice manager during SY 2005--2006?**

**56. What was the average number of food safety training (group or individual) hours per full-time manager during school year 2005--2006?**

# National Cost Survey

**57. Which of the following agencies, representatives, or groups provided food safety and/or HACCP-based training for your school district between the beginning of school year 2004 and school year ending in 2006? (Check all that apply.)**

- [ ] Foodservice staff
- [ ] State Department of Education
- [ ] State or local level Health Department
- [ ] USDA Extension Service (state or local levels)
- [ ] School Nutrition Association (state or local levels)
- [ ] For-profit trainer or provider organization (consultant, software company)
- [ ] Food or supply vendor
- [ ] Other (please specify)

**58. What were the estimated TOTAL costs or fees of these trainings?**

**59. Which of the following topics of training were provided for your school foodservice program staff between the beginning of school year 2004 and school year ending 2006? (Check all that apply.)**

- [ ] Food safety principles
- [ ] Time and temperature abuse
- [ ] Personal health and hygiene
- [ ] Standard operating procedures
- [ ] Process approach to HACCP
- [ ] Critical control points
- [ ] Safe cooking and holding temperatures
- [ ] HACCP documentation
- [ ] Corrective action procedures
- [ ] Other (please specify)

# National Cost Survey

**60. Please indicate your level of agreement to these statements about food safety training using the following scale: Strongly disagree, disagree, neutral, agree, strongly agree.**

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| There was an increase in the amount of food safety training provided to site level foodservice workers due to the new requirement to implement HACCP. | ◯ | ◯ | ◯ | ◯ | ◯ |

**61. Please indicate your level of agreement to these statements about food safety training using the following scale: Strongly disagree, disagree, neutral, agree, strongly agree.**

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| There was an increase in the amount of food safety training provided to foodservice managers due to the new requirement to implement HACCP. | ◯ | ◯ | ◯ | ◯ | ◯ |

## 24. Section IV: HACCP-Based Standard Operating Procedures-What did you write?

Directions: Please respond to the following questions about writing and implementing HACCP-based standard operating procedures in order to comply with the new requirement to implement a food safety plan based on HACCP principles.

**62. What members of the district's HACCP team were mostly responsible for writing the district's original HACCP-based standard operating procedures? (Check all that apply.)**

- ☐ District's Foodservice Director
- ☐ District's Assistant/Associate Foodservice Director
- ☐ District's Supervisors, Coordinators, Trainers
- ☐ Foodservice Managers at site level
- ☐ Foodservice hourly employees
- ☐ Other (please specify)

**63. What was the total estimated number of labor hours spent writing the district's original HACCP-based standard operating procedures (including development and revisions)?**

**64. What is the estimated average, hourly wage of team members that developed the district's HACCP-based standard operating procedures?**

## National Cost Survey

**65. If consulting services were utilized in the development of the district's HACCP plan, what service did the consultant provide? (Check all that apply.)**

- [ ] Conducted site evaluations (hazard analysis reviews)
- [ ] Wrote standard operating procedures
- [ ] Provided HACCP or food safety training
- [ ] Developed HACCP monitoring logs or documentation forms
- [ ] Identified critical control points for recipes
- [ ] Recommended action steps to implement the food safety plan

**66. What was the total dollars spent in consulting fees?**

**67. Did you hire more staff as a result of the new requirement to implement HACCP?**

- ◯ YES
- ◯ NO

### 25.

**68. How many site-level foodservice assistants did you hire as a result of the new requirement to implement HACCP? (Zero is an acceptable answer.)**

**69. What is the average hourly rate for this position?**

**70. How many district-level foodservice staff did you hire as a result of the new requirement to implement HACCP? (Zero is an acceptable answer.)**

**71. What is the average, annual salary for this position?**

### 26. Section V: Health Inspections-Did you get them?

Directions: The 2004 Child Nutrition Reauthorization Act requires school food authorities to obtain at least two health inspections annually. Please respond to the following questions about obtaining annual health inspections in order to comply with this requirement.

**72. Has there been an increase in the cost of obtaining the required number of health inspections for each operation?**

- ◯ YES
- ◯ NO

# National Cost Survey

**73. What is the annual cost paid by your district to obtain the required number of health inspections FOR EACH operation where food is prepared or served? (Zero is an acceptable answer.)**

**74. What entity provides your district's health inspections? (Check all that apply.)**

- ☐ Local health department
- ☐ State health department
- ☐ Private, for-profit company
- ☐ Other (please specify)

**75. Has your HACCP plan been evaluated by your state agency?**

- ◯ YES
- ◯ NO

**76. Did your HACCP plan meet evaluation standards?**

- ◯ YES
- ◯ NO

## 27. Section VI: What do you really think?

**77. What do you perceive to be the greatest, overall challenges with implementation of your district's HACCP-based food safety plan?**

**78. If hindsight is 20/20 and cost was no object, what would you have done differently in implementing your food safety program?**

# National Cost Survey

**79. Do you think your district's investments in a HACCP-based food safety plan have resulted in safer food served to children in your district? Why or why not?**

**80. Do you think the HACCP requirement has resulted in safer food served to children nationally? Why or why not?**

## 28. Section VII: Almost done! What about you?

**81. Based on 2006--2007 figures, what was the student enrollment in your school district?**

**82. How many sites prepare, or prepare and serve food in your district, and thus are required to have a food safety plan?**

**83. Please select what USDA region represents your school district:**

- [ ] Northeast Region (Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont)
- [ ] Mid-Atlantic region (Delaware, District of Columbia, Maryland, New Jersey, Pennsylvania, Virginia, Virgin Islands, West Virginia)
- [ ] Southeast Region (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee)
- [ ] Midwest Region (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin)
- [ ] Southwest Region (Arkansas, Louisiana, New Mexico, Oklahoma, Texas)
- [ ] Mountain Plains Region (Colorado, Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota, Utah, Wyoming)
- [ ] Western Region (Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, Washington)

National Cost Survey

**84. In what year is your Coordinated Review Effort (CRE) by your state's Department of Education or Child Nutrition Program oversight agency scheduled?**

- ◯ 2007--2008
- ◯ 2008--2009
- ◯ 2009--2010
- ◯ 2010--2011
- ◯ 2011--2012
- ◯ Don't know

**85. Which of the following titles best describes your job with the school district?**

- ◯ District Foodservice Director
- ◯ District Foodservice Manager
- ◯ Business Manager
- ◯ Health Coordinator
- ◯ Superintendent
- ◯ Principal
- ◯ Curriculum Coordinator
- ◯ Cook/supervisor
- ◯ Head Cook
- ◯ Other (please specify)

**86. What is the highest level of formal education you have completed?**

- ◯ Some high school
- ◯ High school
- ◯ Some college
- ◯ Associate's degree (2-year)
- ◯ Bachelor's degree (4-year)
- ◯ Graduate degree

Please specify graduate degree

**29.**

## National Cost Survey

**87. Identify areas of study in your formal education program (i.e., major). (Check all that apply.)**

- [ ] Business
- [ ] Education
- [ ] Hotel and Restaurant Management
- [ ] Culinary Arts
- [ ] Marketing
- [ ] Nutrition
- [ ] Other (please specify)

**30.**

**88. What other credentials do you have? (Check all that apply.)**

- [ ] Registered Dietitian
- [ ] Licensed Dietitian
- [ ] School Nutrition Specialist (SNS)
- [ ] Certified Culinarian
- [ ] Certified Food Safety Professional (CFSP)
- [ ] National Food Safety Certificate (ServSafe®, National Registry of Food Safety Professionals, or Prometric™ (previously known as Experior))--All approved by the Conference on Food Protection
- [ ] Dietary Manager
- [ ] Other (please specify)

**89. What is the total number of years you have worked in school foodservice?**

**90. Which of the following describes the management of your school foodservice program?**

- ◯ Self-operated
- ◯ Management company

**91. What is your gender?**

- ◯ Female
- ◯ Male

**31. Thank you!**

## APPENDIX E. DATA COLLECTION E-MAILS

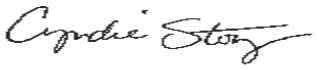
April 4, 2008

Dear School Foodservice Administrator:

In a few days, you will be receiving an email request to complete an on-line survey for research aimed at determining inputs required to implement the federal HACCP mandate. We believe this research will provide insights into the actual and hidden costs of developing food safety plans for school foodservice programs. The survey does ask for information about large and small equipment purchases, etc. It may be helpful to pull these records before beginning the survey.

You are receiving this communication in advance of the survey as we have found many people like to know ahead of time that they will be contacted. We estimate it will take about 10-20 minutes of your time to complete the survey. Your participation is completely voluntary. Thank you in advance for your time and consideration.

Sincerely,



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Phone 515.294.3527
Email: cstrohbe@iastate.edu

April 8, 2008

Dear School Foodservice Administrator:

I am writing to ask your help in a research study aimed at identifying inputs associated with implementing and sustaining your food safety plan based on HACCP principles. As you are aware, this federal mandate was unfunded. This research will provide an answer to the question of costs of implementation, all of which were borne by **your school district.**

Your input is valuable; we need to hear from all districts that have been identified as part of the national sample. Increased response rate will improve the rigor of this study. It is hoped the results of this study can be used in future policy making and legislative efforts. Please complete the on-line survey by **April 25, 2008**. The survey may be found at [survey link]. An effort has been made to keep this survey short by allowing you to see only the questions that pertain to your operation. It should take about 10-20 minutes to complete. The survey does ask for information about large and small equipment purchases, etc. It may be helpful to pull these records before beginning the survey. Your participation is completely voluntary, and you may skip any questions you do not feel comfortable answering.

If you have questions regarding this research study, please contact Cyndie Story by phone at 904-387-6839 or e-mail at chefcyndie@bellsouth.net. My supervising professor is Dr. Catherine Strohbehn, who can be reached by phone at 515-294-3527 or e-mail at cstrohbe@iastate.edu.
Please be assured that all responses will be reported as a group, and individual responses will be kept confidential. The questionnaire is coded with a number for follow-up purposes only. If you have any questions about your rights as a research participant or research-related injury, please contact the Office of Research Assurances, 1138 Pearson Hall, Iowa State University, 515-294-3315; dament@iastate.edu.

In advance of your participation, I would like to extend a big thank you for your time and effort in this research study.

Sincerely,

Cyndie Story, MEd, RD, CSFP
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April 15, 2008

Dear School Foodservice Administrator:

Approximately 1 week ago, you should have received a request to complete an on-line survey for research aimed at determining inputs required within your school district to implement the federal HACCP mandate. You are receiving this contact in the event the first request was filtered by your district's email system. Your input is valuable and we really need your participation in this national study.

The results of this study can be used in future policy making and legislative efforts. Please complete the on-line survey by **April 25, 2008**. The survey may be found at [survey link]. An effort has been made to keep this survey short by allowing you to see only the questions that pertain to your operation. It should take about 10-20 minutes to complete. The survey does ask for information about large and small equipment purchases, etc. It may be helpful to pull these records before beginning the survey.
Your participation is completely voluntary, and you may skip any questions you do not feel comfortable answering.

If you have questions regarding this research study, please contact Cyndie Story by phone at 904-387-6839 or e-mail at chefcyndie@bellsouth.net. My supervising professor is Dr. Catherine Strohbehn, who can be reached by phone at 515-294-3527 or e-mail at cstrohbe@iastate.edu.
Please be assured that all responses will be reported as a group, and your individual responses will be kept confidential. We have numbered the questionnaire for follow-up purposes only. If you have any questions about the rights of research subjects or research-related injury, please contact the Office of Research Assurances, 1138 Pearson Hall, Iowa State University, 515-294-3315; dament@iastate.edu.

In advance of your participation, we would like to extend a big thank you for your time and effort in this valuable research study.

Sincerely,

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April 22, 2008

Dear School Foodservice Administrator:

Almost two weeks ago, you should have received a request to complete an on-line survey for research aimed at determining inputs required within your school district to implement the federal HACCP mandate.

This is a plea to obtain your valuable input. It is directors like you who provide information that leads to great progress in our school nutrition programs. The results of this study can be used in future policy making and legislative efforts.

Please complete the on-line survey by **May 2, 2008**. The survey may be found at [survey link]. We have made an effort to keep this survey short by only allowing you to see the questions that pertain to your operation. It should only take 10-20 minutes to complete. The survey does ask for information about large and small equipment purchases, etc. It may be helpful to pull these records before beginning the survey. Your participation is completely voluntary, and you may skip any questions you do not feel comfortable answering.

If you have questions regarding this research study, please contact Cyndie Story by phone at 904-387-6839 or e-mail at chefcyndie@bellsouth.net. My supervising professor is Dr. Catherine Strohbehn, who can be reached by phone at 515-294-3527 or e-mail at cstrohbe@iastate.edu.
Please be assured that all responses will be reported as a group, and your individual responses will be kept confidential. We have numbered the questionnaire for follow-up purposes only. If you have any questions about the rights of research subjects or research-related injury, please contact the Office of Research Assurances, 1138 Pearson Hall, Iowa State University, 515-294-3315; dament@iastate.edu.

In advance of your participation, we would like to extend a big thank you for your time and effort in this valuable research study.

Sincerely,

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## APPENDIX F. SITE MANAGER INTERVIEW FORM

1. What type of thermometer do you use?_____

Do you follow the SOP on calibrating bi-metallic stemmed thermometer, if so, how often_____

Do you keep of record of the calibration process? Yes_____No_____

If yes, how long does it take to calibrate and record the calibration process?_____

2. Do you conduct in-house food safety self-inspections? Yes_____No_____
How often?_____

How long does it take you to conduct the inspection?_____

May I have a copy of the form?_____Yes_____No

3. How do you use your monitoring logs, such as the ones posted on the walk-in cooler door?

4. How long does it take you, as the site manager, to review monitoring logs?

5. What are some of the types of problems you have found when reviewing the monitoring logs?

6. What were the greatest overall challenges with implementation of your district's HACCP-based food safety plan in your building?

7. Do you think your district's investments in a HACCP-based food safety plan have resulted in safer food served to children in your district? Yes_____ No_____

Why?

Why not?

8. Do you think the HACCP requirement has resulted in safer food served to children nationally? Yes_____No_____

Why?

Why not?

9. If blast chillers were purchased for this site, what was the manufacturer's name:_____ and model number_____.

Did you purchase a:

- Reach in
- Roll in or roll thru
- Walk in

Does your blast chiller print a label noting times and temperatures? ___Yes ____No

10. If warming units were purchased for use at this site, what was the manufacturer's name:_____ and model number_____.

11. If a freezer/cooler alarm system was purchased for this site, what was the manufacturer's name:_____ and model number_____.

12. Were other large pieces of equipment purchased to comply with your food safety plan?

13. Were chill sticks purchased for this building?

No_____

Yes_____

- How many small (64 oz) units were purchased?_____
- How many medium (128 oz) units were purchased?_____
- How many large (265 oz) units were purchased?_____

14. Were color-coded cutting board sets purchased for this building?

No_____

Yes_____

How many 12" X 18" sets were purchased?_____

How many 15" X 20" sets were purchased?_____

How many 18" X 24" sets were purchased?_____

15. Were any of the following small equipment items purchased for your building and if so, how many were purchased?

| Item | Did you purchase? | How many were purchased? |
|---|---|---|
| Color-coded knives | | |
| Color-coded cleaning and sanitizing buckets | | |
| Ice transfer containers/ buckets | | |
| Electronic, touchless paper towel dispenser | | |
| Ice packs | | |
| Shallow pans (2" deep) | | |
| Optic sensor faucets for handsink | | |
| Hands-free foot pedals for handsink | | |
| Digitizer hand soap dispensers (Timer/counter mechanism) | | |
| Nail brushes | | |
| Hot food merchandisers | | |
| Soup kettles | | |
| Food warmers (heat lamps) | | |
| Other: | | |

## APPENDIX G. DISTRICT-LEVEL SCHOOL FOODSERVICE HACCP ADMINISTRATOR INTERVIEW FORM

Date:_____
School District Code: _____

Name:_____Title:_____

1. How many total years of experience do you have in the school foodservice setting?

2. How many hours of food safety/HACCP training did you participate in prior to implementing the plan?

3. Who provided the food safety/HACCP training?

4. Are you currently certified in food safety? Yes_____No_____
Certifying organization:_____

4. What food safety activities were in place in the district prior to the federal mandate?

5. What food safety activities were documented prior to the federal mandate?

6. If blast chillers were purchased, what was the

Manufacturer's name:

Model number(s)

Did you purchase a:

- Reach in
- Roll in or roll thru
- Walk in

Does your blast chiller print a label noting times and temperatures? ___Yes ____No

What was the cost for each blast chiller?_____

7. If warming units were purchased, what was the
Manufacture's name:

Model number(s)

What was the cost for each warming unit?_____

8. If freezer/cooler alarm systems were purchased what was the
Manufacture's name:

Model number(s)

What was the cost for each freezer/cooler alarm system?_____

9. Were other large equipment items (>$500 expenditure) purchased to comply with the new requirement to implement HACCP? Please list description and cost of unit.

| **Item description** | **Unit cost** |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |

10. Were thermometers purchased to comply with the new requirement to implement HACCP?
Yes_____No_____
Please describe the type of thermometer:

11. Were chill sticks purchased to comply with the new requirement to implement HACCP?
Yes_____No_____Size: 64 oz_____128 oz_____265 oz

12. Were color-coded cutting board sets purchased to comply with the new requirement to implement HACCP?
Yes_____ No_____
How many 12" X 18" sets were purchased?_____
How many 15" X 20" sets were purchased?_____
How many 18" X 24" sets were purchased?_____

13. If any of the following small equipment (<$500 expenditure) items were purchased to comply with the new requirement, please select the item and identify how many were purchased and what was the cost per item.

| Item | Did you purchase? | How many were purchased? | What was the cost per item? |
|---|---|---|---|
| Color-coded knives | | | |
| Color-coded cleaning and sanitizing buckets | | | |
| Ice transfer containers/ buckets | | | |
| Electronic, touchless paper towel dispenser | | | |
| Ice packs | | | |
| Shallow pans (2" deep) | | | |
| Optic sensor faucets for handsink | | | |
| Hands-free foot pedals for handsink | | | |
| Digitizer for hand soap dispensers (Timer/counter) | | | |
| Nail brushes | | | |
| Hot food merchandisers | | | |
| Soup kettles | | | |
| Food warmers (heat lamps) | | | |
| Other:_____ | | | |

14. Were other small equipment items (<$500 expenditure) purchased to comply with the new requirement to implement HACCP? Please list description and cost of unit.

| **Item description** | **Unit cost** |
|---|---|
| | |
| | |
| | |
| | |
| | |

**The following questions are asked to identify your perceptions of school district support for the food safety program:**

15. How supportive do you believe the superintendent is in meeting your food safety goals?
5-Very supportive 4-Somewhat supportive 3-Supportive 2-Unsupportive 1-Very Unsupportive

16. Describe ways in which you believe the superintendent demonstrates his/her support of your program's food safety plan.

17. How supportive do you believe the Board of Education is in meeting your food safety goals?
5-Very supportive 4-Somewhat supportive 3-Supportive 2-Unsupportive 1-Very Unsupportive

18. Describe ways in which you believe the Board of Education demonstrates their support of your program's food safety plan

19. How supportive do you believe the maintenance department is in meeting your food safety goals?
5-Very supportive 4-Somewhat supportive 3-Supportive 2-Unsupportive 1-Very Unsupportive

20. Describe ways in which you believe the maintenance department demonstrates their support of your program's food safety plan

21. Is your program being assessed any fees by the school district for food safety related services? Yes_____No_____
If yes, please describe:

20. How would you rate cost in terms of a barrier to implementing and sustaining your food safety program?
5-Critical barrier 4-Important barrier 3-Barrier 2-Some barrier 1-No barrier

21. What policies exist to support your food safety program?
Board level policies
Foodservice dept. policies
Site-level policies

22. What policies are needed to support your food safety program?
Board level policies
Foodservice dept. policies
Site-level policies

23. Have you requested additional funding from the school district for your food safety plan?
_____Yes_____No
24. Is food safety a line item in your school foodservice budget?_____Yes_____No

25. Is there anything else you would like to share regarding HACCP or food safety?

## APPENDIX H. TELEPHONE SCRIPT FOR SITE OBSERVATION REQUEST

Good Morning or Afternoon! My name is Cyndie Story, and I am a doctoral student at Iowa State University in the Foodservice and Lodging Management program. Presently, I am working on a research project aimed at identifying what school districts have done in order to comply with the 2004 HACCP mandate. The research project consists of several phases, including observational research, as well as interviews of school foodservice administrators and site managers who were responsible for implementing a food safety plan based on HACCP principles.

I am interested in visiting two cafeterias in your school district; one elementary and one secondary. I would like to visit on a day that food is received. Food safety tasks will be observed and timed, and the site manager will be asked a few short question regarding food safety practices and procedures. In addition, I would like to interview the administrator responsible for HACCP implementation. Would you be willing to participate in this phase of the project? **Your participation is voluntary.** It would involve your willingness to let me observe food safety practices in two of your cafeterias, and interview the HACCP administrator and site managers about your operation. **You may choose not to respond to any of the questions if you wish.** The visit would last no more than 6 hours, and it will not be necessary for you to spend all of the time with me. All information gathered through observations and interviews at your school district will be shared with you directly during the visit. **Information you provide and observations made by the researcher will be kept confidential.** All gathered information will be summarized before it is published or presented. The site visit will be scheduled at your convenience.

Is this something you would be willing to help with?

Thank you! I will send a confirmation letter and consent form in the mail to you today.

Would you like to schedule a day and time for the site visit now?

Thanks for your help with this project

## APPENDIX I. SITE VISIT CONSENT LETTER AND SIGNATURE FORM

April 24, 2008

Dear School Foodservice Director

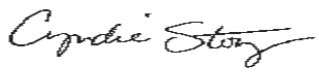
Thank you for agreeing to participate in this important project aimed at identifying inputs associated with implementing and sustaining food safety plans based on HACCP principles. This research will provide answers to questions about costs of implementation.

As part of the research, I will be visiting two cafeterias in your school district that you recommend; one elementary and one secondary. Schools with developed HACCP practices that are regularly documented are desired. The time involved in completing food safety tasks will be recorded on an observation form and the site manager will be asked a few short questions regarding food safety practices and procedures. In addition, I would like to interview the administrator responsible for district-wide HACCP implementation.

Below, please find the participation consent signature section. As a representative of the school district, please sign and return to me in the self-addressed enclosed envelope. If you have questions regarding this research study, please contact me by phone at 904-387-6839 or e-mail at chefcyndie@bellsouth.net. My supervising professor is Dr. Catherine Strohbehn, who can be
reached by phone at 515-294-3527 or e-mail at cstrohbe@iastate.edu.

Please be assured that all responses will be reported as a group, and individual responses will be kept confidential. If you have any questions about your rights as a research participant or research-related injury, please contact the Office of Research Assurances, 1138 Pearson Hall, Iowa State University, 515-294-3315; dament@iastate.edu.

Sincerely,



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Jacksonville, Fl 32205
Phone 904.387.6839
Email: chefcyndie@bellsouth.net

I, _____agree to participate in the HACCP research currently being conducted by Cyndie Story, Iowa State University Doctoral Student. I understand this means I will allow Cyndie Story to conduct a site visit at one elementary and one secondary school within the _____school district. I can terminate the site visit at any time, and thus my participation in the project.

_____ _____

Signature of school district representative Date